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STATE OF CALIFORNIA  
DEPARTMENT OF NATURAL RESOURCES

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CALIFORNIA  
MINERAL PRODUCTION  
AND  
DIRECTORY OF MINERAL PRODUCERS  
FOR 1944

BULLETIN 132

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DIVISION OF MINES  
FERRY BUILDING, SAN FRANCISCO

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DIVISION OF MINES

FERRY BUILDING, SAN FRANCISCO

WALTER W. BRADLEY

State Mineralogist

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San Francisco]

BULLETIN No. 132

[October 1945

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CALIFORNIA  
MINERAL PRODUCTION  
AND  
DIRECTORY OF MINERAL PRODUCERS  
FOR 1944

By  
HENRY H. SYMONS





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## LETTER OF TRANSMITTAL

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*To His Excellency, THE HONORABLE EARL WARREN,  
Governor of the State of California.*

SIR: I have the honor to herewith transmit Bulletin No. 132 of the Division of Mines, of the Department of Natural Resources, being the annual report of the statistics of the mineral production of California.

The remarkable variety, total values, and wide distribution of many of our minerals revealed herein show California's importance as a producer of commercial minerals among the states of the Union.

Respectfully submitted.

WARREN T. HANNUM,  
Director of Natural Resources.



## INTRODUCTION

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It is the endeavor of the staff of the State Division of Mines (formerly State Mining Bureau), in these annual reports of the mineral industries of California, to so compile the statistics of production that they will be of actual use to producers and to those interested in the utilization of the mineral products of our State, while at the same time keeping the individual's data confidential. In addition to the mere figures of output, we have included descriptions of the uses and characteristics of many of the materials, as well as a brief mention of their occurrences.

The compilation of accurate and dependable figures is an extremely difficult undertaking, and the State Mineralogist takes the opportunity of here expressing his appreciation of the cooperation of the producers in making this work possible. A fuller appreciation of the value of early responses to the requests sent out in January will result in earlier completion of the manuscript. Statistics lose much of their value if their publication is unnecessarily delayed.

Some of the data relative to properties and uses of many of the minerals herein described are repeated from preceding reports, as it is intended that this annual statistical bulletin shall be somewhat of a compendium of information on California's commercial minerals and their utilization.

WALTER W. BRADLEY,  
State Mineralogist.

STATE OF CALIFORNIA  
 DEPARTMENT OF NATURAL RESOURCES  
 DIVISION OF MINES  
 WALTER W. BRADLEY  
 STATE MINERALOGIST

O R E G O N

OUTLINE MAP  
 OF  
**CALIFORNIA**

SCALE  




M E X I C O

# MINERAL INDUSTRY, CALIFORNIA, 1944

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## DATA COMPILED FROM DIRECT RETURNS FROM PRODUCERS IN ANSWER TO INQUIRIES SENT OUT BY THE CALI- FORNIA STATE DIVISION OF MINES, FERRY BUILDING, SAN FRANCISCO, CALIFORNIA

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### CHAPTER ONE

The total value of the mineral output for California for the year 1944 was \$469,774,525, being an increase of \$43,329,245 over the total of 1943 which was \$426,445,280. The increase was due to stimulated output owing to war demand. There were sixty-two different mineral substances, exclusive of a segregation of various stones grouped under gems; all fifty-eight counties of the State contributing to the list.

As revealed by the following, the salient features of 1944 as compared with the previous year were: Increases in total value were registered by such groups of mineral substances as fuels, industrial materials, and salines, while the metals and structural materials showed a decline in total value. The value of the year's mineral output, being the largest of any on record, was due chiefly to the unprecedented war-time demand for petroleum and to the amount of natural gas utilized. The greatest annual amount and value for their output in California were registered by bromine, dolomite, gypsum, iron ore, limestone, lithia, manganese ore, natural gas, potash, pyrite, silica (quartz and glass sand), soda (soda ash and salt-cake), soapstone and talc. Petroleum and salt registered their greatest annual yield, and gold the smallest output since 1848, the year of its discovery.

Of the fuels, petroleum increased from 284,145,702 barrels, valued at \$289,323,406 in 1943, to 311,717,804 barrels, valued at \$330,659,802, an increase of 9.7 percent in amount and 14.2 percent in value. The 1944 output of crude oil was the largest on record but was exceeded in value by that of 1926 when the barrel value was \$1.538 compared with \$1.061 in 1944. Natural gas utilized increased from 443,219,847 M cu. ft., worth \$28,046,729 in 1943, to 467,743,258 M cu. ft., valued at \$31,797,418, and was the largest annual consumption in this State.

Of the metals, an increase in annual value was recorded by copper, lead, manganese ore, silver, and zinc; all others showed a decline in amount and value from 1943. The value of the gold yield decreased from \$5,191,480 in 1943 to \$4,108,055, which was the smallest of any year since 1848, the year gold was discovered in California. Copper increased from 17,172,440 lbs., worth \$2,232,417 in 1943, to 25,584,865 lbs. worth \$3,453,957; manganese ore increased from 25,729 long tons, worth \$957,317, to 30,263 long tons, worth \$1,098,555; and zinc increased from 5,170,627 lbs., worth \$558,427, to 16,456,103 lbs., worth \$1,875,996; while chromite decreased from 56,201 long tons, worth \$2,334,838 to 27,900 long tons valued at \$1,190,513; quicksilver decreased from 33,948 flasks, worth \$6,177,159, to 28,097 flasks, worth \$3,178,969; and tungsten ore from 254,118 units, worth \$5,910,745, to 203,965 units, valued at \$4,835,810.

Of the structural materials, the group as a whole decreased from a total value of \$55,055,016 in 1943 to \$50,777,220, although increases in value were registered by granite, marble, sandstone, slate, and miscellaneous stone. Miscellaneous stone increased from a total value of \$21,716,223 to \$25,138,003, while cement decreased from 18,515,085 barrels worth \$27,865,466 in 1943, to 14,599,752 barrels, worth \$21,249,520, and brick and hollow building tile decreased from a total value of \$4,368,675 to \$3,930,662.

Of the industrial materials, the group as a whole increased in total value from \$10,656,288 in 1943 to \$11,515,327 in 1944 with all of the more important materials showing an increase in value for the year but diatomite and mineral water, both of which registered a decline.

### By Substances

The following table shows the comparative yield of mineral substances of California for 1943 and 1944, as compiled from the returns received at the State Division of Mines, San Francisco, in answer to inquiry sent to producers:

Substance	1943		1944		Increase + Decrease— Value
	Amount	Value	Amount	Value	
Bentonite.....	11,480 tons	\$118,257	25,581 tons	\$180,065	\$61,808+
Borates.....	216,687 tons	4,953,174	234,860 tons	5,264,864	311,690+
Brick and hollow building tile.....		4,368,675		3,930,662	438,013—
Carbon dioxide.....	227,424 M cu. ft.	248,126	*	*	+
Cement.....	18,515,085 bbls.	27,865,466	14,599,752 bbls.	21,249,520	6,615,946—
Chromite.....	56,201 long tons	2,334,838	27,900 long tons	1,190,513	1,144,325—
Clay (pottery).....	622,019 tons	1,185,240	491,363 tons	1,241,652	56,412+
Copper.....	17,172,440 lbs.	2,232,417	25,584,865 lbs.	3,453,957	1,221,540+
Dolomite.....	331,251 tons	472,756	217,018 tons	619,425	146,669+
Gem materials.....		329,868	*	*	—
Gold.....	148,328 fine ozs.	5,191,480	117,373 fine ozs.	4,108,055	1,083,425—
Granite.....		148,160		222,943	74,783+
Gypsum.....	495,967 tons	916,883	558,488 tons	949,833	32,950+
Iron ore.....	907,458 tons	2,341,827	905,981 tons	2,360,694	18,867+
Lead.....	11,811,034 lbs.	885,827	11,408,381 lbs.	912,670	26,843+
Limestone.....	495,262 tons	1,378,647	734,425 tons	1,714,414	335,767+
Magnesia and other magnesium salts.....	9,026 tons	728,065	113,927 tons	4,537,381	3,809,316+
Manganese ore.....	25,729 long tons	957,317	30,263 long tons	1,098,555	141,238+
Mineral water.....	22,022,314 gals.	814,700	24,445,814 gals.	812,645	2,055—
Natural gas.....	443,219,847 M cu. ft.	28,046,729	467,743,258 M cu. ft.	31,797,418	3,750,689+
Petroleum.....	284,145,702 bbls.	289,323,406	311,717,804 bbls.	330,659,802	41,336,396+
Pumice and volcanic ash.....	21,154 tons	142,665	34,525 tons	272,064	129,399+
Quicksilver.....	33,948 flasks	6,177,159	28,097 flasks	3,178,969	2,998,190—
Salt.....	631,176 tons	1,695,231	769,873 tons	2,060,960	365,729+
Silica (glass sand and quartz).....	161,318 tons	533,434	274,291 tons	830,311	296,877+
Silver.....	609,075 fine ozs.	433,120	775,936 fine ozs.	553,910	120,790+
Soapstone and talc.....	63,012 tons	723,056	64,041 tons	824,052	100,996+
Soda (soda ash and salt cake).....	260,590 tons	3,166,576	299,574 tons	3,647,630	481,054+
Stone, miscellaneous <sup>b</sup> .....	32,499,456 tons	21,716,223	35,370,143 tons	25,138,003	3,421,780+
Tungsten ore.....	254,118 units	5,910,745	203,965 units	4,835,810	1,074,935—
Zinc.....	5,170,627 lbs.	558,427	16,456,103 lbs.	1,875,996	1,317,569+
Unapportioned..... <sup>c</sup>		10,546,786	<sup>d</sup>	10,251,752	295,061—
Total value.....		\$426,445,280		\$469,774,525	
Net increase.....					\$43,329,245

\* Included under 'Unapportioned.'

<sup>b</sup> Includes macadam, crushed rock, ballast, rubble riprap, sand and gravel.

<sup>c</sup> Includes asbestos, barite, bituminous rock, bromine, calcium chloride, coal, diatomite, feldspar, iodine, lithia, magnesite, mineral paint, molybdenum ore, platinum group metals, potash, pyrite, sandstone, sillimanite group, slate, paving blocks, tube-mill pebbles, strontium, titanium.

<sup>d</sup> Includes antimony, asbestos, barite, bituminous rock, bromine, cadmium, calcium chloride, carbon dioxide, coal, diatomite, feldspar, fluor spar, gems, iodine, lithia, magnesite, marble, mica, mineral paint, molybdenum ore, potash, pyrite, sandstone, sillimanite group, slate, strontium, tin, titanium, tube-mill pebbles.

The salines group increased in total value from \$15,660,400 in 1943 to \$20,983,104 with borates, bromine, magnesium salts, potash, salt, and soda (soda ash and salt-cake), showing increases in amount and value, and only calcium chloride and iodine showing a decreased output.

### By Counties

The following table shows the comparative value of the mineral production of the various counties in the State for the years 1943 and 1944:

County	1943	1944
Alameda.....	\$5,336,917	\$8,089,026
Alpine.....	20,241	2,214
Amador.....	534,098	283,206
Butte.....	755,968	929,239
Calaveras.....	2,831,543	2,642,638
Colusa.....	93,486	14,491
Contra Costa.....	4,284,821	3,244,179
Del Norte.....	609,664	509,703
El Dorado.....	304,449	298,859
Fresno.....	41,039,427	49,800,782
Glenn.....	915,030	33,736
Humboldt.....	237,827	373,525
Imperial.....	685,203	564,263
Inyo.....	8,025,406	6,716,413
Kern.....	94,245,359	108,257,342
Kings.....	16,015,695	13,984,044
Lake.....	798,381	468,389
Lassen.....	25,353	26,495
Los Angeles.....	100,688,245	108,138,154
Madera.....	55,575	74,141
Marin.....	280,119	312,849
Mariposa.....	443,693	1,306,411
Mendocino.....	82,480	152,039
Merced.....	1,118,313	853,905
Modoc.....	28,691	255,229
Mono.....	56,205	123,173
Monterey.....	1,142,800	4,942,121
Napa.....	948,557	709,686
Nevada.....	890,647	619,179
Orange.....	28,068,896	33,312,154
Placer.....	277,283	250,237
Plumas.....	207,509	78,714
Riverside.....	5,452,740	5,203,973
Sacramento.....	6,588,998	7,832,687
San Benito.....	3,528,462	1,985,039
San Bernardino.....	22,042,939	23,358,596
San Diego.....	1,650,586	1,985,032
San Francisco.....	432,500	120,000
San Joaquin.....	1,621,661	1,369,198
San Luis Obispo.....	1,037,062	704,818
San Mateo.....	3,041,434	2,452,525
Santa Barbara.....	16,830,725	23,908,079
Santa Clara.....	8,128,250	5,228,668
Santa Cruz.....	2,900,752	1,762,807
Shasta.....	3,766,717	2,615,373
Sierra.....	176,016	114,195
Siskiyou.....	1,896,246	2,507,921
Solano.....	4,931,944	5,973,575
Sonoma.....	1,521,314	905,121
Stanislaus.....	1,112,486	545,376
Sutter.....	74,905	89,246
Tehama.....	72,917	101,823
Trinity.....	323,123	516,066
Tulare.....	301,292	615,630
Tuolumne.....	783,508	465,734
Ventura.....	25,080,976	30,545,897
Yolo.....	365,176	394,299
Yuba.....	1,734,670	1,106,311
Total value.....	\$426,445,280	\$469,774,525

**Total Mineral Production of California, by Years, Since 1887**

The following tabulation gives the total value of mineral production of California by years since 1887, in which year compilation of such data by the State Mining Bureau (now Division of Mines) began. At the side of these figures have been placed the values of the most important metal and nonmetal items—gold and petroleum.

In the same period copper made an important growth beginning with 1897 following the entry of the Shasta County mines, and later Plumas County. Cement increased rapidly from 1902, while crushed rock, sand and gravel as a group paralleled the cement increase. Quick-silver has been up and down. Mineral water and salt have always been important items, but the values fluctuate. Borax has increased materially since 1896. War-time increases, 1915-1918, were shown by chromite, copper, lead, magnesite, manganese, silver, tungsten and zinc. Most of these later declined, though silver, structural materials and copper increased in 1920-1924. Natural gas showed a steady increase from 1907, and in 1928-1934, also in 1943-1944, its value was second only to petroleum. In 1939-1944 increases in output similar to those of 1915-1918 were shown by many mineral substances.

In 1929 the output of gold was the smallest of any year since its discovery, up to that time. From 1930 to 1940 there was a rapid increase in gold production, due in part to the raise in price per ounce, then from 1941 to 1944 the sharpest decline in the gold yield with the smallest annual production in 1944.



## Total Mineral Production of California, by Years, Since 1887

Year	Total value of all minerals	Gold, value	Petroleum, value
1887	\$19,785,868	\$13,588,614	\$1,357,144
1888	19,469,320	12,750,000	1,380,666
1889	16,681,731	11,212,913	368,048
1890	18,039,666	12,309,793	384,200
1891	18,872,413	12,728,869	401,264
1892	18,300,168	12,571,900	561,333
1893	18,811,261	12,422,811	608,092
1894	20,203,294	13,923,281	1,064,521
1895	22,844,663	15,334,317	1,000,235
1896	24,291,398	17,181,562	1,180,793
1897	25,142,441	15,871,401	1,918,269
1898	27,289,079	15,906,478	2,376,420
1899	29,313,460	15,336,031	2,660,793
1900	32,622,945	15,863,355	4,152,928
1901	34,355,981	16,989,044	2,961,102
1902	35,069,105	16,910,320	4,692,189
1903	37,759,040	16,471,264	7,313,271
1904	43,778,348	19,109,600	8,317,809
1905	43,069,227	19,197,043	9,007,820
1906	46,776,085	18,732,452	9,238,020
1907	55,697,949	16,727,928	16,783,943
1908	66,363,198	18,761,559	26,566,181
1909	82,972,209	20,237,870	32,398,187
1910	88,419,079	19,715,440	37,689,542
1911	87,497,879	19,738,908	40,552,088
1912	88,972,385	19,713,478	41,568,344
1913	98,644,639	20,406,958	48,578,014
1914	93,314,773	20,653,496	47,487,109
1915	96,663,369	22,442,296	43,503,837
1916	127,901,610	21,410,741	57,421,334
1917	161,202,962	20,087,504	86,976,209
1918	199,753,837	16,529,162	127,459,221
1919	195,830,002	16,695,955	142,610,563
1920	242,099,667	14,311,043	178,394,937
1921	268,157,472	15,704,822	203,138,225
1922	245,183,826	14,670,346	173,381,265
1923	344,024,678	13,379,013	242,731,309
1924	374,620,789	13,150,175	274,652,874
1925	434,519,660	13,065,330	330,609,829
1926	450,330,856	11,923,481	345,546,677
1927	366,781,394	11,671,018	260,735,498
1928	332,224,233	10,785,315	229,998,680
1929	432,248,228	8,526,703	321,366,863
1930	365,604,695	9,451,162	271,699,046
1931	215,964,420	10,814,162	141,835,723
1932	199,196,493	11,765,726	143,890,247
1933	206,489,058	15,683,075	143,063,972
1934	237,374,709	25,131,284	159,529,671
1935	263,404,317	31,165,050	179,335,311
1936	327,804,268	37,710,470	211,667,185
1937	361,515,951	41,110,230	237,845,872
1938	380,444,976	45,889,515	258,345,343
1939	352,462,564	50,234,240	226,358,856
1940	342,825,817	50,948,485	207,479,800
1941	374,326,228	49,307,755	218,838,171
1942	408,738,434	29,679,895	242,481,545
1943	426,445,280	5,191,480	289,323,406
1944	469,774,525	4,108,055	330,659,802
Totals	\$10,418,871,922	\$1,102,909,173	\$6,632,749,596

## CHAPTER TWO

## FUELS

Among the most important mineral products of California are its fuels. This subdivision includes coal, natural gas, and petroleum, the combined values of which make up practically 77 per cent of the State's entire mineral output for the year 1944.

There are deposits of peat known in several localities in California, small amounts of which are used as a fertilizer, and in stockfood preparations, but none has yet been recorded as utilized for fuel.

Comparison of values during 1943 and 1944 is shown in the following table:

Substance	1943		1944		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Coal*					
Natural gas	443,219,847 M cu. ft.	\$28,046,729	467,743,258 M cu. ft.	\$31,797,418	\$3,750,689+
Petroleum	284,145,702 bbls.	289,323,406	311,717,804 bbls.	330,659,802	41,336,396+
Total values		\$317,370,135		\$362,457,220	
Net increase					\$45,087,085

\* Concealed under 'Unapportioned.'

## COAL

*Bibliography:* State Mineralogist Reports VII, XII-XV (inc.), XVII, XIX-XXVIII (inc.), XXVI, XXXI, XXXV, XXXVII, U. S. Geol. Surv., Bulletins 285, 316, 421, 431, 471, 581; Ann. Rept. 22, Pl. III.

The coal produced in California during 1944 is concealed under the 'Unapportioned' item so as not to reveal the output of a single producer in Amador and Trinity counties. The 1943-1944 total production amounted to 219 net tons valued at \$1,721 f.o.b. mine. This coal was consumed by the local market and also used on the property for camp purposes, power and forge, to carry on regular operations and development work.

## Total Coal Production of California

The very considerable output of coal in the years previous to 1883 was almost entirely from the Mount Diablo district, Contra Costa County. Later the Tesla mine in Corral Hollow, Alameda County, was an important producer for a few years. Stone Canyon, Monterey County, was also an important producer for a short time, and there has been some coal shipped from properties in Amador, Fresno, Orange, Riverside, Siskiyou and Trinity counties. The following tabulation gives the annual tonnages and values, according to available records:

Coal Output and Value, by Years

Year	Tons	Value	Year	Tons	Value
1861	6,620	\$38,065	1903	93,026	\$265,383
1862	23,400	134,550	1904	79,062	376,494
1863	43,200	248,400	1905	46,500	144,500
1864	50,700	291,525	1906	24,850	61,600
1865	60,530	348,048	1907	23,734	55,849
1866	84,020	483,115	1908	18,496	55,503
1867	124,690	716,968	1909	49,389	216,913
1868	143,676	826,137	1910	11,033	23,484
1869	157,234	904,096	1911	11,047	18,297
1870	141,890	815,868	1912	14,484	39,092
1871	152,493	876,835	1913	25,198	85,809
1872	190,859	1,097,439	1914	11,859	28,806
1873	186,611	1,073,013	1915	10,299	26,662
1874	215,352	1,238,274	1916	4,037	7,030
1875	166,638	958,169	1917	3,527	7,691
1876	128,049	736,282	1918	6,343	16,149
1877	107,789	619,787	1919	2,983	8,203
1878	134,237	771,863	1920	2,078	5,450
1879	147,879	850,304	1921	12,467	63,578
1880	236,950	1,262,463	1922	27,020	135,100
1881	140,000	805,000	1923	1,010	5,090
1882	112,592	647,404	1924	1,425	8,800
1883	76,162	380,810	1925	730	3,880
1884	77,485	309,950	1926	1,100	5,000
1885	71,615	286,460	1927	200	1,100
1886	100,000	300,000	1928	782	4,542
1887	50,000	150,000	1929	450	2,476
1888	95,000	380,000	1930	10,885	59,858
1889	121,280	288,232	1931	12,551	77,607
1890	110,711	283,019	1932	9,508	36,468
1891	93,301	204,902	1933	2,612	11,367
1892	85,178	209,711	1934	13,549	52,720
1893	72,603	167,555	1935	8,049	32,745
1894	59,887	139,862	1936	370	1,815
1895	79,858	193,790	1937	269	2,933
1896	70,649	161,335	1938	275	1,650
1897	87,449	196,255	1939*	1,750	8,100
1898	143,045	337,475	1940		
1899	160,941	420,109	1941*	190	1,046
1900	176,956	535,531	1942		
1901	150,724	401,772	1943*	219	1,721
1902	88,460	248,622	1944		
			Totals	5,270,009	\$23,399,506

The tonnages in the above table for the years 1861-1866 (incl.) are taken from the U. S. Geological Survey, "Mineral Resources of the U. S., 1910," p. 107. The values assigned for the years previous to 1883 are those given by W. A. Goodyear (Mineral Res., 1882, pp. 93-94), being an average of \$5.75 per ton. From 1887 to date the figures are those of the California State Mining Bureau.

\* Annual details concealed under 'Unapportioned.'

### NATURAL GAS

*Bibliography:* State Mineralogist Reports VII, X, XII, XIII, XIV, XXIX, XXXVII. Bulletins 3, 16, 19, 69, 73, 89, 118. Summary Oil and Gas Supervisor, Dec., 1919; Aug., 1922; Mar., 1923; Mar. and Apr., 1926.

Statistics on the production of natural gas in California are in a considerable degree difficult to arrive at, as much of it that is utilized directly at the wells for heating, lighting, and driving gas engines is not measured. Hence, it is necessary to approximate the output of many of the operators in the oil fields, estimated on the number of lights, and on the number and horsepower of gas engines and steam boilers thus operated. The figures here given are for gas utilized locally and also that sold for distribution to consumers; and we consider are not over-estimated, particularly in the seven oil-producing counties. It must be remembered that some of our important oil fields are removed many miles

from the site of any other industry, and that the gathering of small amounts of gas and transporting it for any considerable distance may not always be profitable, nor is it often possible to have pipe-line facilities available to handle the gas accompanying the early gas production in newly developed fields. Wherever feasible, casing-head gas is used in driving gas engines for pumping and drilling, and in firing the boilers of steam-driven plants.

#### Production and Value

During 1944 there were 467,743,258 M. cu. ft. of natural gas, worth \$31,797,418, produced and utilized (sold or used) in California as reported to the Division of Mines, compared with 443,219,847 M. cubic feet, valued at \$28,046,729 in 1943. The 1944 output of utilized natural gas was the largest annual yield on record in this State. Distribution by counties of natural gas utilized (sold and used) in 1944 was as follows:

Utilized Production of Natural Gas in California, 1944

County	M cubic feet	Value
Fresno.....	32,686,565	\$2,836,676
Kern.....	72,111,360	3,768,075
Kings.....	63,648,158	3,294,746
Los Angeles.....	52,806,375	3,843,357
Orange.....	16,704,577	1,119,308
Sacramento.....	72,644,058	5,490,344
San Joaquin.....	11,337,469	798,908
Santa Barbara.....	5,901,658	389,032
Solano.....	70,526,204	5,872,446
Ventura.....	53,179,388	3,245,920
Contra Costa, Humboldt, Glenn, Madera, Mendocino, Stanislaus, Sutter, Tulare, Yolo*	16,197,446	1,138,606
Totals.....	467,743,258	\$31,797,418

\* Combined to conceal outputs of individual operators in each.

Increases in amount of utilized natural gas over 1943 were reported in Contra Costa, Kern, Orange, Sacramento, Santa Barbara, Solano, Tulare and Ventura counties; while decreases were registered by Fresno, Kings, Los Angeles, and San Joaquin counties. Los Angeles County which led in quantity output from 1922 to 1942 though exceeded in value only in 1943 by both Sacramento and Solano counties, was passed in both amount and value in 1944 by Sacramento and Solano counties; and in amount only, by Kern, Kings and Ventura counties.

There is a rather wide variation in prices quoted for natural gas because a considerable part is used directly in the field for driving gas engines and firing boilers, and is therefore not measured nor sold. Such companies as have placed a valuation on the gas that was thus used in 1943 gave from 1.5¢ to 35¢ per 1000 cu. ft. at the well. From the totals shown in the tabulation following herein, the average value for all fields in 1942 works out at approximately 6.33¢ per M cu. ft. Approximately 7000 cu. ft. of gas is equal to one barrel of oil in heating value, and is so accounted for by many operators. In driving gas engines, about 4000 cu. ft. per 24 hr. are consumed by a 25-h.p. engine, and 63,700 cu. ft. per day for heating a 70-h.p. steam boiler, which figures have been utilized in compiling this report, in those cases where gas was not metered.

## Natural Gas Production in California Since 1888

The production of natural gas in California by years since 1888 is given in the following table. The first economic use of natural gas in California was from the famous courthouse well at Stockton, bored in 1854-1858. Beginning about 1883 and for several succeeding years, a number of gas wells were brought in around Stockton, and later at Sacramento. Natural gas was known in a number of other localities, and occasionally utilized in a small way, notably at Kelseyville in Lake County, and in Humboldt County near Petrolia and Eureka, but there are no available authentic records of amounts or values previous to the year 1888. The most important developments in the commercial production of natural gas have been coincident with developments in the oil fields, by utilizing the casing-head gas as well as that from dry-gas wells, the most recent from the latter being in Solano and Sacramento counties.

Natural Gas Production in California Since 1888

Year	M cubic feet	Value	Year	M cubic feet	Value
1888	<sup>a</sup> 12,000	\$10,000	1917	44,343,020	\$2,964,922
1889	<sup>a</sup> 14,500	12,680	1918	46,373,052	3,289,524
1890	<sup>a</sup> 41,250	33,000	1919	52,173,503	4,041,217
1891	<sup>a</sup> 39,000	30,000	1920	58,567,772	3,898,286
1892	<sup>a</sup> 75,000	55,000	1921	67,043,797	4,704,678
1893	<sup>a</sup> 84,000	68,500	1922	103,628,027	6,990,030
1894	<sup>a</sup> 85,000	75,000	1923	240,405,397	15,661,433
1895	<sup>a</sup> 110,000	100,000	1924	209,021,596	15,153,140
1896	<sup>a</sup> 131,000	110,157	1925	194,719,924	15,890,032
1897	<sup>a</sup> 71,300	62,657	1926	214,549,477	19,465,347
1898	<sup>a</sup> 111,165	74,424	1927	224,686,940	20,447,294
1899	115,110	95,000	1928	260,887,116	22,260,947
1900	40,566	34,578	1929	400,129,201	29,675,546
1901	120,800	92,034	1930	315,513,952	24,559,840
1902	120,968	99,443	1931	344,959,920	16,690,695
1903	120,134	75,237	1932	284,168,872	16,272,061
1904	144,437	91,035	1933	271,743,544	15,403,514
1905	148,345	102,479	1934	263,207,517	14,408,761
1906	168,175	109,489	1935	302,447,193	17,680,661
1907	169,991	114,759	1936	298,922,708	18,585,970
1908	842,883	474,584	1937	323,883,714	19,859,865
1909	1,148,467	616,932	1938	332,358,439	22,310,755
1910	10,579,933	1,676,367	1939	340,754,804	21,551,646
1911	<sup>a</sup> 5,000,000	491,859	1940	352,871,945	20,618,983
1912	<sup>a</sup> 12,600,000	940,076	1941	378,173,737	21,522,445
1913	14,210,836	1,053,292	1942	413,180,942	25,698,032
1914	16,529,963	1,049,470	1943	443,219,847	28,046,729
1915	21,992,892	1,706,480	1944	467,743,258	31,797,418
1916	28,134,365	2,871,751			
			Totals	6,963,541,303	\$491,776,154

<sup>a</sup> Quantity, in part, estimated, where values only were reported.

<sup>b</sup> Tabulations published previously to 1933 included values of CO<sub>2</sub>, now shown under "Industrial Materials."

## Gasoline from Natural Gas

More or less gas usually accompanies the petroleum in the oil fields, and such gas carries varying amounts of gasoline. A total of 80 plants were in operation in 1944 recovering gasoline by compression or absorption from this 'casing-head' gas. After the gasoline is extracted the remaining 'dry gas' so far as practicable is taken into pipe lines, by which it is distributed to consumers, both domestic and commercial.

Natural gas gasoline produced during 1944 was reported from all fields by 80 plants; a total of 610,904,480 gallons valued at \$27,565,477,

as compared with 528,771,009 gallons valued at \$21,968,165 from 84 plants in 1943. In 1944 there was also a total of 118,100,084 gallons of liquefied petroleum gases, valued at \$2,857,168, as compared with 90,732,022 gallons worth \$2,238,954, as reported in 1943.

**Natural Gas Gasoline and Liquefied Natural Gas for 1944**

County	Natural gas gasoline		Liquefied natural gases	
	Gallons	Value	Gallons	Value
Fresno and Kings.....	110,569,253	\$4,670,432	52,194,405	\$1,304,860
Kern.....	79,502,488	3,691,683	36,553,269	840,725
Los Angeles.....	253,740,087	11,865,547	6,489,291	162,232
Orange.....	63,015,672	3,031,807	6,441,150	161,029
Santa Barbara.....	17,794,395	705,617	2,792,052	61,425
Ventura.....	86,282,585	3,600,391	13,620,717	326,897
Totals.....	610,904,480	\$27,565,477	118,100,084	\$2,857,168

The usual recoveries of gasoline from natural gas vary from  $\frac{1}{2}$  gal. to 3 gal. per 1000 cu. ft. of gas handled, the average being about 1 gal. per 1000 cu. ft. The U. S. Bureau of Mines Report by Knudsen<sup>1</sup> gives the average recovered for 1944 as 1.598 gallons per 1000 cubic feet of gas treated. His figures show the following production by methods:

	M cubic feet natural gas treated	Gallons of gasoline recovered	Recovery gallons per M cubic feet
Oil absorption.....	395,859,605	632,768,352	1,598

**PETROLEUM**

*Bibliography:* State Mineralogist Reports IV, VII, X, XII, XIII, XXIX, XXXI, XXXIII-XXXV, XXXVII. Bulletins 3, 11, 16, 19, 31, 32, 63, 69, 73, 82, 84, 89, 118. Reports of Oil and Gas Supervisor 1915 to date (issued in monthly chapters since April, 1919, to June, 1929, and quarterly from then on.) U. S. Geol. Surv. Bulletins 213, 285, 309, 317, 321, 322, 340, 357, 398, 406, 431, 471, 541, 581, 603, 621, 623, 653, 691. Prof. Papers 116, 117. "American Petroleum; Supply and Demand"; Amer. Petr. Inst., 1925.

The crude petroleum produced in California during 1944 amounted to a total of 311,717,804 barrels, valued at \$330,659,802 at the well. This was the largest annual yield of crude oil ever reported in this State although the 1926 value exceeded that of 1944. The 1943 output was 284,145,702 barrels, worth \$289,323,406. The totals of quantity are compiled from monthly reports filed by the operators with the State Oil and Gas Supervisor. Values of crude oils were the same in 1944 as in 1943, but on the first of August subsidies were granted to producers in oil fields where the output per well per day was less than nine barrels.

The question of the value of the crude oil yield at the well is a difficult one to settle with exactitude principally because a large part of the output is not sold until after refining. The large refiners are also

<sup>1</sup> Knudsen, E. T., The Petroleum Situation in the Pacific Coast Territory (Monthly for 1944), U. S. Bureau of Mines.

large producers of crude oil which they send direct from well to plant, hence much of the crude oil is not sold as such.

The value used in the statistical reports of the State Mining Bureau and the Division of Mines from 1914 to 1927 (inc.) was derived from an average of actual sales of crude oil of all grades in each field of the State and their average applied to the total yield of each respective field. The 1929-1933 values, used by the Division of Mines, were obtained by using the production of crude oil by gravities produced in each field and applying an average of current price quotations for crude oil at the well as compiled by California Oil and Gas Association.

The values given to the 1934-1944 petroleum output by this department were obtained by using the average gravity oil for each field, to which was applied the average quotation for the year of said grade oil.

TABLE A  
Production and Value of Crude Oil by Counties

County	1943		1944	
	Barrels	Value	Barrels	Value
Fresno.....	37,869,219	\$37,779,881	45,325,244	\$46,159,669
Kern.....	84,934,943	\$6,174,973	92,694,311	\$8,829,308
Kings.....	10,326,575	12,907,422	9,459,556	10,689,298
Los Angeles.....	87,983,756	90,193,521	88,646,069	95,872,140
Orange.....	26,441,558	26,325,466	30,417,719	31,227,748
Santa Barbara.....	16,285,344	13,523,527	21,298,935	21,012,512
Ventura.....	20,279,921	22,400,750	23,797,902	26,792,447
Other counties.....	<sup>a</sup> 24,386	17,866	<sup>b</sup> 78,068	76,680
Totals.....	284,145,702	\$289,323,406	311,717,804	\$330,659,802

(<sup>a</sup>) Includes San Bernardino, San Luis Obispo, Santa Clara, and Tulare counties.

(<sup>b</sup>) Includes San Luis Obispo and Santa Clara counties.

It will be noted in the above that all the major petroleum producing counties, with the exception of Kings County, showed an increase in output in 1944 over that of 1943. Kern County led all other counties in production, passing Los Angeles County which outranked Kern since 1923.

The foregoing totals showed an average price of \$1.061 per barrel for the year 1944, as compared with \$1.018 in 1943; \$0.980 in 1942, \$0.953 in 1941, \$0.929 in 1940, \$1.009 in 1939, \$1.038 in 1938, \$0.997 in 1937, \$0.986 in 1936, and \$0.870 in 1935.

TABLE B  
Average Price of Oil per Barrel, by Counties, 1935-1944

County	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944
Fresno.....	\$0.941	\$1.209	\$1.255	\$1.261	\$1.173	\$1.068	\$0.963	\$0.885	\$0.998	\$1.084
Kern.....	.729	.863	.886	.890	.826	.838	.878	0.894	1.015	1.066
Kings.....	1.045	1.338	1.390	1.390	1.430	1.262	1.217	1.250	1.250	1.130
Los Angeles.....	.914	.974	.968	1.064	1.064	.941	1.008	1.039	1.025	1.081
Orange.....	.898	.937	.945	.956	.952	.900	.901	1.055	0.996	1.027
San Luis Obispo.....										
Santa Barbara.....	.924	1.143	1.083	.974	.830	.620	.644	0.709	0.830	0.987
Santa Clara.....										
Ventura.....	.901	.971	1.050	1.102	1.090	1.087	1.102	1.129	1.105	1.121
State averages.....	\$0.970	\$0.986	\$0.997	\$1.038	\$1.009	\$0.929	\$0.953	\$0.980	\$1.018	\$1.061

For several years previous to 1919, the State average value per barrel at the well for crude oil as determined by the statistical returns was noted to practically coincide with the quotations during the same years for 23° gravity oil in the San Joaquin Valley fields. In 1919 and since, the average values have worked out at figures corresponding to quotations up to, in one year as high as 28° oil, due to the large yield of high-gravity oils from the new fields in the Los Angeles-Orange counties area.

#### TOTAL PETROLEUM PRODUCTION OF CALIFORNIA

The presence of oil seepages and springs in Los Angeles and Ventura counties was known and utilized in a small way early in the history of California. Some also was shipped to refineries at San Francisco from Santa Barbara and Humboldt counties. In the light of present-day developments, the following reference to the previous year's production of oil and its future prospects as expressed by the San Francisco Bulletin of January 8, 1866, is strikingly prophetic even though skeptical:

"It is possible that the small quantity received (40,000 or 50,000 gallons in 1865) may be the forerunner of many millions which will, at some future time, lubricate the wheels of commerce and set a trade at work excelling in variety any that has thus far been known on this coast. At present, however, we admit to being a little skeptical about the assumption of the astute Professor Silliman that California will be found to have more oil in its soil than all the whales in the Pacific Ocean."

According to Hanks,<sup>1</sup> in 1874 production amounted to 36 bbl. per day from natural flows in Pico Cañon (Newhall), and at Sulphur Mountain (Ventura County), the oil being of 32° gravity average.

"Work was commenced in Pico Canyon in 1875 by drilling three shallow wells with spring pole, all of which yielded oil at depths of from 90 to 250 feet. Actual work of development commenced with steam machinery in 1877."<sup>2</sup>

In 1877 Pico averaged 40-50 bbl. daily, and Ventura 80 bbl. daily. In 1878, there was some production (at 60 bbl. per day, for a time) from wells in Moody Gulch, near Los Gatos, Santa Clara County, the oil being of 46° Baumé.

The first wells in the Coalinga, Fresno County, and Summerland, Santa Barbara County, fields were drilled in 1890, but Coalinga did not make its influence felt conspicuously on the state's annual output until 1903. The Summerland yield never has been large. The Salt Lake field near Los Angeles began production in 1894 and in 1897 reached over a million barrels annually.

In the Kern County fields, the first well was drilled in Sunset in 1891, Midway in 1900, McKittrick in 1892, Kern River in 1899. The Sunset-Midway district attained a yield of over 4,000,000 bbl. in 1909, and over 20,000,000 bbl. in 1910. Kern River field produced over 3,000,000 bbl. in 1901.

The first well in the Santa Maria-Lompoc group, Santa Barbara County, was drilled in 1901, and the district advanced to a yield of over 3,000,000 bbl. annually in 1905.

The Whittier-Fullerton field in Los Angeles and Orange counties became an important factor in 1902. The Montebello field, Los Angeles County, was the conspicuous addition in 1918-1919; and Elk Hills, Kern County, with Huntington Beach and Richfield, Orange County,

<sup>1</sup> Hanks, Henry G., Report IV of State Mineralogist, p. 298, 1884.

<sup>2</sup> Idem, p. 301.



in 1920. In 1921, the new fields added were Long Beach and Santa Fe Springs, Los Angeles County; in 1922, Torrance field in Los Angeles County, and Wheeler Ridge field in Kern County; but the production from the large number of new wells started in these new Los Angeles County fields did not reach its peak until August and September, 1923. Dominguez (Compton) came in during 1923; followed by Rosecrans and Inglewood in 1924. Ventura recorded important additions to its producing area in 1925 and 1926. Seal Beach, Orange County, and Mt. Poso, Kern County, were the new fields added in 1926; Round Mountain, Kern County, and Rincon, Ventura County, were the new fields added in 1927; with Potrero in Los Angeles County, Elwood in Santa Barbara County and Kettleman Hills in Kings County in 1928.

During 1929 Playa del Rey was added to the oil fields in Los Angeles County, and more recently a number of others have been added in Fresno, Los Angeles, Kern, and Santa Barbara.

The effect of the advent of these various fields to the producing column will be noted in the tabulation herewith, by years:

TABLE C  
Total Petroleum Production in California

Year	Barrels	Value	Year	Barrels	Value
To and including 1875.....	<sup>a</sup> 175,000	<sup>b</sup> \$472,500	1911.....	84,648,157	\$40,552,088
1876.....	12,000	30,000	1912.....	89,689,250	41,868,344
1877.....	13,000	29,250	1913.....	98,494,532	48,578,014
1878.....	15,227	30,454	1914.....	102,881,907	47,487,109
1879.....	19,858	39,716	1915.....	91,146,620	43,503,837
1880.....	40,552	60,828	1916.....	90,262,557	57,421,334
1881.....	99,862	124,828	1917.....	95,296,309	86,976,209
1882.....	128,636	257,272	1918.....	99,731,177	127,459,221
1883.....	142,857	285,714	1919.....	101,182,962	142,610,563
1884.....	262,000	655,000	1920.....	103,377,361	178,394,937
1885.....	325,000	750,750	1921.....	112,599,860	203,138,225
1886.....	<sup>a</sup> 377,145	<sup>b</sup> 870,205	1922.....	138,468,222	173,381,265
1887.....	678,572	1,357,144	1923.....	262,875,690	242,731,309
1888.....	690,333	1,380,666	1924.....	228,933,471	274,652,874
1889.....	303,220	368,048	1925.....	232,492,147	330,609,829
1890.....	307,360	384,200	1926.....	224,673,281	345,546,677
1891.....	323,600	401,264	1927.....	231,195,774	260,735,498
1892.....	385,049	561,333	1928.....	231,811,465	229,998,680
1893.....	470,179	608,092	1929.....	292,534,221	321,366,863
1894.....	783,078	1,064,521	1930.....	227,328,988	271,699,046
1895.....	1,245,339	1,000,235	1931.....	188,310,605	141,835,723
1896.....	1,257,780	1,180,793	1932.....	177,745,286	142,890,247
1897.....	1,911,569	1,918,269	1933.....	172,139,362	143,063,972
1898.....	2,249,088	2,376,420	1934.....	174,721,282	159,529,671
1899.....	2,677,875	2,660,793	1935.....	205,979,855	179,335,311
1900.....	4,319,950	4,152,928	1936.....	214,776,227	211,667,185
1901.....	7,710,315	2,961,102	1937.....	238,558,562	237,845,872
1902.....	14,356,910	4,692,189	1938.....	249,395,763	258,354,343
1903.....	24,340,839	7,313,271	1939.....	224,253,110	226,358,856
1904.....	29,736,003	8,317,809	1940.....	223,294,805	207,479,800
1905.....	34,275,701	9,007,820	1941.....	229,664,784	218,838,171
1906.....	32,624,000	9,238,020	1942.....	247,491,289	242,481,545
1907.....	40,311,171	16,783,943	1943.....	284,145,702	289,323,406
1908.....	48,306,910	26,566,181	1944.....	311,717,804	330,659,802
1909.....	58,191,723	32,398,187			
1910.....	77,697,568	37,689,542	Totals.....	6,668,683,656	\$6,636,364,113

<sup>a</sup> U. S. G. S. Min. Res. of U. S., 1886, p. 440, for quantities to and including 1886.

<sup>b</sup> Values have been estimated for the years to and including 1886, after consulting a number of contemporaneous publications, including the Mining & Scientific Press, Reports of the State Mineralogist, and U. S. Reports. The figures for 1887 to date are from records of the State Mining Bureau.

**Well Data:**

The following table is compiled from monthly statements issued by the American Petroleum Institute:

**TABLE D**  
**Wells Operated, by Fields—1944**

Field	Wells producing Dec., 1943	Wells producing Dec., 1944	Wells com- pleted during year	Daily initial output	Wells aban- doned during year	Bbls. per well produced per day Dec., 1943	Bbls. per well produced per day Dec., 1944
GROUP No. 1—Antelope Hills.....	19	28	9	2,095	0	99.8	64.1
Arvin.....	2	2			0	22.5	14.5
Bellevue.....		3	3	3,257	2		221.0
Belridge, North.....	68	77	4	3,372	0	82.2	89.3
Belridge, South.....	495	693	204	8,378	6	17.1	17.3
Buena Vista Hills.....	822	889	67	28,988	10	17.4	33.3
Burrel.....	1	2	1	100	2	48.0	33.0
Canal.....	39	39			0	89.3	90.6
Canfield Ranch.....	1	1			1	21.0	26.0
Coalinga, East.....	582	684	94	8,321	27	35.9	33.0
Coalinga, Nose.....	217	218	4	3,630	6	281.9	282.7
Coalinga, West.....	714	762	56	4,082	12	9.3	10.4
Coles Levee.....	98	101	8	4,066	1	165.4	168.7
Dyer Creek.....	1				2	18.0	0.0
Edison.....	110	136	27	2,607	7	32.1	24.9
Elk Hills.....	232	340	108	34,161	1	66.9	123.9
Fruitvale.....	177	198	22	1,879	3	38.5	41.0
Gosford.....		2	2	1,210	0		19.0
Greeley.....	84	90	7	6,003	3	166.0	160.1
Helm.....	7	24	18	3,258	0	107.4	112.2
Jacalitos.....	7	16	10	2,932	2	45.1	71.8
Kern Front.....	623	715	80	6,233	7	19.7	18.0
Kern River.....	1,967	2,028	33	1,528	3	4.6	4.9
Kettleman North Dome.....	266	295	13	5,958	0	157.5	138.7
Lanare.....	1	3	1	179	0	55.0	70.3
Lost Hills.....	382	373	3	58	2	9.3	9.1
McClung.....	1	2			3	275.0	56.5
McKittrick.....	292	323	33	2,218	11	15.9	17.6
Midway Sunset.....	2,541	2,681	138	11,352	37	15.9	15.2
Mountain View.....	167	169	5	671	9	20.4	18.5
Mount Poso.....	456	481	26	1,461	14	51.0	43.3
Paloma.....	4	17	15	8,633	0	259.3	376.5
Pleasant Valley.....	6	17	11	7,186	0	216.2	165.2
Raisin City, East.....	9	8			0	94.0	63.6
Raisin City, West.....	5	19	13	3,265	1	145.2	146.4
Rio Bravo.....	100	100	1	1,166	0	148.2	161.8
Riverdale.....	25	45	19	6,492	2	108.4	120.0
Round Mountain.....	282	295	15	1,409	12	40.3	33.4
Shafter.....		1			0		10.0
Strand, East.....	3	6	3	3,049	0	91.7	116.5
Strand, West.....	14	17	2	654	1	133.4	104.1
Tejon.....	2	7	5	481	4	33.5	37.0
Ten Section.....	117	119			1	128.8	101.0
Union Avenue.....	3	3			0	33.0	29.3
Wasco.....	13	13			0	209.4	154.0
Wheeler Ridge.....	34	34			0	7.6	7.2
Miscellaneous Fields.....		37	28	1,299	1		17.8
GROUP No. 2—Aliso Canyon.....	18	26	8	7,654	0	125.4	135.7
Capitan.....	53	53			0	65.5	46.6
Del Valle.....	13	17	4	2,630	0	93.7	106.0
Elwood.....	52	57	3	835	2	124.5	99.8
Gato Ridge.....	25	30	4	1,294	1	183.1	154.8
Newhall Potrero.....	42	46	5	1,401	0	127.7	97.3
Oak Canyon.....	8	9	2	387	2	101.8	139.4
Padre Canyon.....	18	21	4	2,085	0	51.6	87.6
Rincon.....	73	87	14	3,566	1	42.3	55.2
San Martinez.....	16	23	7	2,629	2	89.7	114.5
San Miguelito.....	27	31	5	5,737	0	183.3	191.6
Santa Barbara.....	16	14			2	4.8	5.5
Santa Maria.....	291	310	20	4,214	9	40.2	46.0
Santa Maria Valley.....	253	343	85	22,248	3	40.5	107.3
Summerland.....	5	5			0	2.2	1.0
Ventura Avenue.....	437	487	35	30,866	0	99.8	100.1
Ventura-Newhall.....	513	528	32	4,549	26	8.9	12.2
Watsonville.....	7	7			0	3.6	3.6

TABLE D—Continued  
Wells Operated, by Fields—1944

Field	Wells producing Dec., 1943	Wells producing Dec., 1944	Wells com- pleted during year	Daily initial output	Wells aban- doned during year	Bbls. per well produced per day Dec., 1943	Bbls. per well produced per day Dec., 1944
GROUP No. 3—Brea-Olinda.....	400	409	7	1,409	1	28.2	29.1
Buena Park.....	1	2	1	90	0	104.0	58.0
Coyote, East.....	133	144	12	1,030	1	41.1	37.4
Coyote, West.....	116	136	20	9,100	0	105.5	90.9
Dominguez.....	299	308	10	6,977	2	76.9	64.5
El Segundo.....	33	33	2	375	4	29.6	25.1
Huntington Beach.....	713	794	71	13,815	16	56.2	59.6
Inglewood.....	296	303	6	1,216	2	65.3	54.9
Lawndale.....	3	3	—	—	0	9.0	9.3
Long Beach.....	1,132	1,143	6	381	54	27.3	24.8
Los Angeles- Salt Lake.....	97	97	—	—	0	5.1	5.8
Montebello.....	341	348	10	910	16	32.3	30.3
Newport.....	2	1	—	—	0	10.5	11.8
Playa Del Rey.....	110	111	—	—	0	22.3	22.8
Potrero.....	25	26	1	183	0	36.2	36.8
Richfield.....	311	320	7	636	5	22.7	21.7
Rosecrans.....	186	197	5	811	5	31.1	29.8
Santa Fe Springs.....	557	559	—	—	14	34.3	32.9
Seal Beach.....	132	141	7	7,027	2	55.4	57.0
Torrance.....	639	680	32	3,457	21	13.5	12.6
Turnbull Canyon.....	5	5	—	—	0	59.4	41.4
Whittier.....	160	163	3	65	4	6.4	6.4
Wilmington.....	1,166	1,314	144	26,635	0	82.3	74.1
Yorba Linda.....	11	13	3	392	3	63.8	56.2
GROUP No. 4—GAS FIELDS—							
Buena Vista Hills.....	13	9	—	—	—	—	—
Buena Vista Lake.....	2	1	—	—	—	—	—
Buttonwillow.....	14	7	—	—	—	—	—
Coles Levee.....	4	5	—	—	—	—	—
Corning.....	—	—	1	Gas	—	—	—
El Segundo.....	3	1	—	—	—	—	—
Fairfield Knolls.....	—	1	—	—	—	—	—
Goleta.....	6	2	2	Gas	—	—	—
Honker.....	—	—	—	—	—	—	—
Marysville Buttes.....	5	4	—	—	—	—	—
McDonald Island.....	6	5	—	—	—	—	—
Mendota.....	1	—	3	Gas	—	—	—
Midway-Sunset.....	—	—	1	Gas	—	—	—
Rio Vista.....	63	73	18	Gas	5	—	—
Roberts Island.....	1	1	—	—	—	—	—
Santa Fe Springs.....	—	1	—	—	—	—	—
Semi-Tropic.....	11	6	—	—	—	—	—
Suisun.....	—	—	3	Gas	—	—	—
Tompkins Hill.....	2	2	—	—	—	—	—
Tracy.....	1	1	—	—	—	—	—
Trico (Delano).....	—	16	—	—	—	—	—
Vernalis.....	2	2	—	—	—	—	—
Willows.....	—	1	—	—	—	—	—
Wilmington.....	—	—	1	Gas	—	—	—
Miscellaneous Drillings.....	—	—	—	—	195	—	—
Totals.....	19,852	21,457	1,688	346,235	591	40.2	41.3

#### Specific Gravity of Oils Produced

The proportion of heavy and light oil produced in the various fields is shown in Table E, following, for which we are indebted to the Standard Oil Company. Specific gravities in California range from 8° Baumé in the Casmalia field, Santa Barbara County, 65° in Helm field, Fresno County.

California crude oils are all essentially of asphalt base, with a few notable exceptions. In the following localities are wells yielding crudes containing both asphalt and paraffine constituents: Oil City field, Coalinga; a few deep wells in East Side field, Coalinga; a considerable part

of the Ventura County field; Western Minerals area, south of Maricopa; Wheeler Ridge, Kern County.

**TABLE E**  
Production of Light and Heavy Oils, by Fields, for 1944

Field	Under 20° (barrels)	20° and above (barrels)	Total (barrels)
San Joaquin Valley—			
Antelope Hills.....	679,643		679,643
Arvin.....		13,534	13,534
Belridge North.....	13,665	2,336,464	2,350,129
Belridge South.....	3,918,414	61,778	3,980,192
Bellevue.....		150,147	150,147
Burrel.....		11,739	11,739
Canal.....		1,292,429	1,292,429
Canfield Ranch.....		13,337	13,337
Coalinga, East and West.....	3,589,303	7,082,636	10,671,939
Coalinga Eocene.....		24,692,957	24,692,957
Coles Levee.....		6,692,538	6,692,538
Devil's Den, Pyramid Hills, etc.....	100,204		100,204
Edison.....	838,870	205,148	1,044,018
Elk Hills.....	1,041,264	6,678,282	7,719,546
Fruitvale.....	2,334,142	716,982	3,051,124
Gosford.....		11,677	11,677
Greeley.....		5,200,602	5,200,602
Helm.....		502,469	502,469
Jacalitos.....		236,194	236,194
Kern Front.....	3,456,256		3,456,256
Kern River and Ant Hills.....	3,554,730	3,626	3,558,356
Kettleman Hills, N. D.....		15,130,473	15,130,473
Lanare.....		41,093	41,093
Lost Hills.....	732,836	537,678	1,270,514
McClung.....		49,180	49,180
McKittrick.....	1,796,961	37,053	1,834,014
Midway Sunset (Incl. B. V. Hills).....	9,563,337	12,421,330	21,984,667
Mount Poso.....	8,012,186		8,012,186
Mt. View.....	5,848	1,139,696	1,145,544
Paloma.....		1,239,061	1,239,061
Panoche Hills.....		371	371
Pleasant Valley.....		933,399	933,399
Poso Creek.....	1,434,234		1,434,234
Raisin City.....		936,715	936,715
Rio Bravo.....		5,891,229	5,891,229
Riverdale.....		1,520,185	1,520,185
Round Mountain (Incl. Coffee Canyon).....	3,230,543	658,967	3,889,510
Shafter.....		4,814	4,814
Strand, East and West.....		814,822	814,822
Ten Sections.....		4,623,765	4,623,765
Tejon.....	54,122		54,122
Union Avenue.....	39,857		39,857
Wasco.....		820,976	820,976
Wheeler Ridge.....		98,713	98,713
Totals.....	44,396,415	102,802,059	147,198,474
Coastal—			
Aliso Canyon.....	6,928	1,092,063	1,098,991
Arroyo Grande.....	52,992		52,992
Capitan.....		1,077,214	1,077,214
Casmalia.....	171,359		171,359
Cat Canyon.....	2,563,852	800	2,564,652
Del Valle.....	496	1,480,142	1,480,638
Elwood.....		2,132,918	2,132,918
Gato Ridge.....	1,771,551		1,771,551
Lompoc.....	539,739	126,011	665,750
Newhall.....	233	22,403	22,636
Newhall Potrero.....		1,903,503	1,903,503
Oak Canyon.....		412,209	412,209
Oreutt.....		1,459,484	1,459,484
Padre Canyon.....		469,488	469,488
Rincon.....		1,504,666	1,504,666
San Miguelito.....		2,113,243	2,113,243
Santa Barbara Mesa.....	33,813		33,813
Santa Maria Valley.....	11,303,256		11,303,256
Summerland.....	2,455		2,455
Ventura Avenue.....		17,481,367	17,481,367
Ventura County.....	406,144	1,770,735	2,176,879
Watsonville.....	9,150		9,150
Totals.....	16,861,968	33,046,246	49,908,214

TABLE E—Continued  
Production of Light and Heavy Oils, by Fields, for 1944

Field	Under 20° (barrels)	20° and above (barrels)	Total (barrels)
Southern California—			
Brea Olinda.....	288,676	4,279,393	4,568,069
Buena Park.....		36,654	36,654
Coyote—East.....	117,353	1,858,426	1,975,779
Coyote—West.....		4,458,258	4,458,258
Dominguez.....		7,872,919	7,872,919
El Segundo.....	178,389	151,599	329,988
Huntington Beach.....	1,537,616	15,617,611	17,155,227
Inglewood.....	274,885	6,184,409	6,459,294
Lawndale.....		10,802	10,802
Long Beach.....	123,332	10,681,788	10,805,120
Los Angeles.....	59,050		59,050
Montebello.....	8,704	3,923,270	3,931,974
Newport Beach.....	5,551		5,551
Playa Del Rey.....	94,714	848,585	943,299
Potrero.....		402,889	402,889
Richfield.....	649,285	1,911,518	2,560,803
Rosecrans.....		2,230,335	2,230,335
Salt Lake.....	120,655		120,655
Santa Fe Springs.....	140	6,818,407	6,818,547
Seal Beach.....		2,825,813	2,825,813
Torrance (Incl. Hermosa).....	2,033,309	1,141,538	3,174,847
Turnbull Canyon.....	2,534	84,427	86,961
Whittier.....	296,882	86,637	383,519
Wilmington.....	8,811,663	28,114,401	36,926,064
Totals.....	14,602,738	99,539,679	114,142,417
Grand totals.....	75,861,121	235,387,984	311,249,105

### Oil in "Storage"

Field, refinery, pipe-line and tank-farm stocks of crude and refined products in the Pacific Coast<sup>1</sup> territory totaled 85,181,355 barrels on December 31, 1944, as compared with 96,504,698 barrels on December 31, 1943, with a total decrease in stock from the preceding year of 11,323,343 barrels. Table F gives a breakdown of stocks as of December 31, 1943 compared with December 31, 1944.

TABLE F

	Dec. 31, 1943 (barrels)	Dec. 31, 1944 (barrels)
1. Gasoline-bearing crude.....	29,592,409	<sup>c</sup> 20,475,444
2. Non-gasoline-bearing crude.....	7,488,474	6,054,501
3. Unblended natural gasoline.....	1,371,845	1,230,640
4. Gasoline (exc. distributing and service stations).....	11,543,307	10,779,164
5. Naphtha distillates.....	<sup>a</sup> 3,842,453	<sup>a</sup> 5,522,603
6. Gas oil and diesel oil.....	10,722,872	10,170,286
7. Fuel oil residuum.....	26,557,502	26,012,283
8. All other stocks.....	<sup>b</sup> 5,385,836	<sup>b</sup> 4,936,436
Totals.....	96,504,698	85,181,355
<sup>a</sup> Estimated amount of unfinished gasoline in Item No. 5.....	3,263,412	4,780,825
<sup>b</sup> Coke included in Item No. 8.....	66,034	151,587
<sup>c</sup> Includes cycle condensate.....		206,704

<sup>1</sup> American Petroleum Institute: Summary of California Oilfield Operation for December, 1944.

Utilization of California Crude Oil

Most of the crude oil produced in California is sent to storage reservoirs at tank farms near the oil fields and from these reservoirs by pipe lines to the refineries, the larger ones of which are located in the vicinity of Los Angeles and on San Francisco Bay.

During 1944 the crude oil consumed in California according to the U. S. Bureau of Mines<sup>1</sup> was 289,708,000 barrels sent to stills at the refineries; 5,007,000 barrels used for cracking; 24,627,000 barrels either consumed as fuel or added to residuum; there were no shipments of crude oil out of the State as such; also stocks were depleted by 10,852,000 barrels from 1943, compared with 1943 when 257,228,000 barrels were sent to the stills; 6,612,000 barrels were used for cracking; 20,785,000 barrels either were used as fuel or added to residuum; and stocks were depleted by 4,136,000 barrels, from the previous year.

The production of petroleum products during 1943 and 1944 is shown in Table G:

TABLE G

Commodity	1943 Amount in barrels	1944 Amount in barrels
Crude petroleum to stills.....	257,228,000	289,708,000
Crude petroleum used for cracking.....	6,612,000	5,007,000
Natural gas gasoline.....	13,886,000	15,066,000
Gasoline and naphtha distillates.....	92,449,000	111,074,000
Kerosene and kerosene distillates.....	4,532,000	4,207,000
Lubricating oils and greases.....	3,694,000	3,886,000
Gas oil and diesel oil.....	39,193,000	34,794,000
Residuum and nongasoline bearing crude (fuel oil) <sup>a</sup> .....	114,928,000	126,366,000
Asphalt and road oil.....	8,992,000	9,122,000
Totals <sup>b</sup> .....	277,726,000	309,781,000
<sup>a</sup> Includes heavy non-gasoline crude oil.....	20,785,000	24,627,000
<sup>b</sup> Total of crude oil and natural gasoline.		

Operating Data

The following tabulation (Table II, page 30) is compiled from data published by the State Division of Oil and Gas,<sup>2</sup> semiannually, and here combined to show the entire year's operations for all fields. The districts are the geographical subdivisions as administered by that Division and which are outlined on the accompanying map.

It will be noted that the State average yield of oil per-well-per-day was 83.2 barrels for the first six months of 1944 and 80.1 barrels for the second. This is somewhat higher than the figures 41.3 barrels average for December derived from American Petroleum Institute data as shown in Table D, on a previous page, due in part at least, to the fact that the latter is on a full-time basis, whereas the Division's figures allow for shut-down time.

<sup>1</sup> Knudsen, E. T., The Petroleum Situation in the Pacific Coast Territory (monthly) 1944, U. S. Bureau of Mines.

<sup>2</sup> Summary of Operations—California Oil Fields: Division of Oil and Gas, Fifteenth Annual Report of State Oil and Gas Supervisor, Vol. 30, No. 1, Jan.-June, 1944, and No. 2, July-Dec., 1944.

**Proved Oil Land**

The total proved oil land and natural gas land in California as of December 31, 1944 was 233,497 acres; an increase of 12,745 acres during the year 1944, according to data furnished by the Division of Oil and Gas<sup>1</sup>. The acreage as of December 31, 1943 and December 31, 1944, by counties, is given in the following Table I:

**TABLE I**  
**Proved Oil and Natural Gas Land**

County	Acre Dec. 31, 1943	Acre Dec. 31, 1944
Butte.....		20
Colusa.....	20	20
Contra Costa.....	730	730
Fresno.....	27,148	30,678
Glenn.....	40	220
Humboldt.....	480	480
Imperial*.....	160	210
Kern.....	104,255	108,760
Kings.....	8,104	8,224
Los Angeles.....	19,581	20,369
Madera.....	500	510
Orange.....	7,348	7,616
Sacramento.....	11,600	11,410
San Bernardino.....	10	
San Joaquin.....	2,040	2,960
San Luis Obispo**.....	280	300
Santa Barbara.....	17,078	18,242
Santa Clara.....	90	90
Solano.....	8,620	8,700
Sonoma.....		20
Stanislaus.....	50	50
Sutter.....	840	840
Tehama.....		20
Tulare.....	5,000	5,000
Ventura.....	7,538	7,788
Yolo.....	240	240
Totals.....	221,752	233,497

<sup>1</sup> Summary of Operations—California Oil Fields; Division of Oil and Gas, Fifteenth Annual Report of State Oil and Gas Supervisor, Vol. 23, No. 4, July-Dec., 1944.

\* Carbon dioxide gas only.

\*\* Includes 80 acres in District No. 4.

TABLE H  
Production Statistics and Operating Data of California Oil Fields—1944

Field	January 1 to June 30				July 1 to December 31				Proved Acreage as of Dec. 31, 1944
	Average number of producing wells— actual	Oil (bbls.)	Production per well per day (bbls.)	Percent- age of time wells produced	Average number of producing wells— actual	Oil (bbls.)	Production per well per day (bbls.)	Percent- age of time wells produced	
Distr. 1—Aliso Canyon.....	20	480,552	240.4	54.9	25	619,502	204.2	66.0	300
Beverly Hills.....	2	19,803	56.1	97.0	2	19,310	56.6	92.7	15
Brea-Olinda.....	361	2,119,603	34.1	94.7	378	2,212,280	33.4	95.2	1,358
Coyote, East.....	171	1,181,383	39.8	95.3	178	1,176,695	37.5	95.9	1,150
Coyote, West.....	153	2,202,196	87.9	90.0	170	2,257,640	79.8	90.5	938
Del Valle.....	30	686,920	140.8	86.8	35	809,592	141.1	89.1	430
Doninguez.....	302	4,072,759	76.8	96.5	307	3,806,569	68.8	98.0	1,263
El Segundo.....	34	159,680	28.3	91.1	33	161,378	27.7	95.9	458
Huntington Beach.....	764	8,325,976	63.9	93.7	799	8,820,897	63.0	95.2	3,045
Inglewood.....	298	3,329,555	64.8	94.7	305	3,131,317	58.4	95.6	850
Lawndale.....	3	4,696	9.9	86.4	4	5,577	8.4	90.6	15
Long Beach.....	1,160	5,470,406	26.9	96.5	1,146	5,321,787	26.2	96.3	1,245
Los Angeles City.....	91	38,362	2.4	95.9	91	39,570	2.4	97.1	250
Montebello.....	344	1,975,836	33.1	95.3	345	1,951,994	32.1	95.9	1,410
Newhall.....	11	11,552	6.4	89.9	10	11,014	6.4	94.2	355
Newhall-Potrero.....	40	995,848	147.9	92.5	38	897,937	135.9	94.5	495
Newport.....	0	0	0	0	0	0	0	0	0
Oak Canyon.....	9	193,714	123.6	95.7	10	224,373	127.6	95.5	140
Playa del Rey.....	121	484,294	21.9	96.2	122	472,564	21.8	96.5	475
Potrero.....	24	205,729	48.7	96.8	25	193,752	43.1	97.7	140
Richfield.....	308	1,207,378	22.4	96.2	310	1,241,935	22.3	97.5	1,230
Rosecrans.....	183	1,131,645	35.5	95.8	177	1,096,166	35.0	96.1	705
Salt Lake.....	8	42,420	30.7	95.1	8	41,002	29.7	93.8	18
Santa Fe Springs.....	555	3,419,182	35.2	96.2	558	3,405,233	34.2	97.0	975
Seal Beach.....	134	1,365,683	58.5	95.8	137	1,459,552	60.8	95.3	420
Torrance.....	649	1,577,584	14.0	96.1	666	1,605,383	13.8	95.2	4,825
Turnbull.....	6	46,761	47.8	89.6	6	37,400	39.1	86.7	65
Whittier.....	161	191,152	6.8	95.4	161	192,727	6.6	98.3	570
Wilmington.....	1,204	18,313,080	86.8	96.3	1,273	18,579,014	81.7	97.1	4,735
Los Angeles County:									
Hyperion Area.....	2	3,933	18.3	59.1	1	5,651	44.1	69.6	10
Puente Area.....					1	5,210	3.8	29.9	10
Western Avenue Area.....					2	4,118	13.5	82.6	20
Whittier Heights Area.....					1	2,257	17.4	70.7	20
Orange County:									
Buena Park Area.....	3	17,506	41.6	77.1	2	20,664	78.2	71.7	20
West Newport Area.....					1	3,510	31.3	60.9	30
San Bernardino County—Chino Area.....	0	0	0	0	0	0	0	0	0
Totals.....	7,151	59,235,188	47.8	95.3	7,327	59,828,600	46.2	96.0	28,195



Distr. 2—Bardsdale.....	151	263,013	10.2	94.3	160	384,982	13.8	94.7	15,350,898	975
Ojai.....	49	17,677	2.4	83.2	70	23,961	2.2	84.1	3,276,034	410
Piru.....	92	215,928	15.2	84.7	92	215,327	15.3	82.9	9,333,570	705
Rincon.....	129	1,900,724	88.9	91.0	139	2,177,013	93.6	90.9	31,524,052	933
Santa Paula.....	38	11,369	2.5	64.7	28	10,081	3.6	54.9	2,253,686	455
Sespe.....	23	48,378	16.2	71.2	22	41,282	13.0	78.5	3,197,055	390
Sumi.....	53	13,422	1.4	98.9	54	13,844	1.4	96.9	2,234,608	620
South Mountain.....	94	260,819	16.1	94.5	97	298,450	17.4	96.0	24,202,596	745
Ventura.....	462	8,437,213	111.4	90.1	486	9,051,320	114.2	88.6	285,300,589	2,415
Ventura County—Oxnard Area.....	5	162,993	294.7	60.8	5	250,106	316.2	86.0	1,103,864	140
Totals.....	1,096	11,331,536	63.5	89.4	1,153	12,466,366	66.0	89.0	377,776,952	7,788
Distr. 3—Arroyo Grande.....	10	28,611	19.7	79.7	12	28,452	18.7	69.1	1,310,031	200
Capitan.....	51	587,639	65.9	96.1	50	492,134	53.6	99.8	8,756,455	220
Casmalia.....	11	74,459	67.9	54.7	17	106,691	61.4	55.6	15,004,212	740
Cat Canyon.....	71	1,989,617	170.5	90.3	84	2,332,584	170.2	88.7	34,497,831	2,980
Elwood.....	60	1,063,778	101.1	96.3	62	1,070,188	95.8	97.9	73,050,913	445
La Goleta Gas.....	36	312,378	65.1	94.2	48	0	0	0	283	400
Lompoc.....	28	17,074	7.0	84.3	29	331,659	64.5	96.3	11,856,579	3,060
Mesa.....	16	339	8.5	22.0	16	16,016	5.9	92.7	3,482,432	22
Moody Gulch.....	1	738,776	21.1	95.5	1	323	5.7	31.0	60,369	10
Santa Maria.....	201	5,049,038	113.2	88.8	202	720,739	20.3	95.7	101,558,615	4,430
Santa Maria Valley.....	276	3,957	4.0	68.1	325	6,394,158	120.8	88.5	49,424,063	5,945
Sargent.....	8	1,215	6.8	97.8	9	3,792	4.1	56.0	774,113	80
Summerland.....	1	9,866,881	81.1	91.3	1	792	6.0	72.3	3,179,957	10
Totals.....	734	9,866,881	81.1	91.3	808	11,497,528	85.3	90.9	302,455,853	18,532
Distr. 4—Antelope Hills.....	18	306,274	108.1	86.5	25	371,737	107.9	74.9	21,532,802	245
Belridge, North.....	65	1,072,693	123.5	73.4	67	1,278,883	137.2	75.6	48,795,971	1,780
Belridge, South.....	535	1,829,437	20.3	92.5	621	2,153,017	20.3	92.7	131,904,972	5,125
Blackwells Corner.....	36	636,023	125.3	77.4	14	33,876	22.5	58.5	38,151	120
Canal.....	1	6,855	38.3	98.4	35	657,149	131.2	77.7	10,382,757	780
Canfield Ranch.....	71	2,954,059	247.8	92.3	72	18,158	62.4	79.1	141,623	30
Coles Levee, North.....	41	0	121.5	88.4	42	2,827,312	236.1	90.4	19,584,034	2,430
Coles Levee, South.....	24	469,203	0	88.4	27	454,513	106.7	85.8	7,294,306	0
Coles Levee, South.....	33	0	4.4	44.1	43	0	0	0	0	0
Devils Den.....	9	3,176	25.4	89.9	5	796	2.9	29.9	94,865	120
Edison.....	119	494,546	69.2	95.8	135	573,670	25.0	92.5	11,042,830	1,740
Elk Hills.....	230	2,775,532	0	87.9	280	4,931,901	104.6	91.6	174,568,866	9,950
Elk Hills.....	31	1,471,022	50.5	87.9	40	0	0	0	0	0
Fruitvale.....	182	2,584,228	189.3	87.2	192	1,636,713	54.5	85.0	32,866,429	2,030
Greeley.....	86	0	0	0	90	2,626,206	181.2	87.5	19,090,296	1,930

TABLE H—Continued  
Production Statistics and Operating Data of California Oil Fields—1944

Field	January 1 to June 30				July 1 to December 31				Cumulative production of oil (bbls.) to end 1944	Proved Acreage as of Dec. 31, 1944
	Average number of producing wells—actual	Oil (bbls.)	Production per well per day (bbls.)	Percent-age of time wells produced	Average number of producing wells—actual	Oil (bbls.)	Production per well per day (bbls.)	Percent-age of time wells produced		
DIST. 4—Continued										
Kern Front.....	530	1,517,282	16.4	95.6	550	1,707,462	17.6	96.0	56,064,307	3,870
Kern River.....	2,128	1,714,625	4.6	95.8	2,160	1,796,774	4.8	95.2	128,986,279	7,135
Lost Hills.....	374	649,758	9.8	96.8	372	628,748	9.5	96.9	55,326,516	2,335
McKittrick-Temblor.....	298	874,141	16.8	95.8	321	983,051	17.3	96.1	197,647,728	1,990
Midway-Sunset.....	3,467	10,205,759	17.2	93.8	3,567	11,863,561	19.2	84.0	197,953,790	542,735
Midway-Sunset.....	414	0			412	0	0	0	0	0
Mt. Poso.....	453	4,103,849	51.3	84.4	458	3,900,797	47.6	97.2	178,874,535	2,860
Mountain View.....	148	550,676	23.8	55.8	147	590,628	24.0	90.4	44,959,857	1,790
Paloma.....	6	210,954	318.2	5.2	16	1,018,142	480.2	72.0	2,008,735	3,370
Paloma.....	41	0			41	0	0	0	0	0
Poso Creek.....	164	801,230	31.4	56.3	176	836,043	27.3	94.5	7,922,417	1,645
Rio Bravo.....	100	2,930,185	173.9	10.4	99	2,992,083	175.8	93.4	27,669,335	1,890
Round Mountain.....	286	2,041,933	40.5	89.0	291	1,877,979	36.1	97.2	43,222,388	2,115
Strand.....	19	339,723	127.2	32.2	20	425,398	125.8	91.8	3,148,562	360
Tecjon.....	4	27,381	44.4	8.2	5	33,839	42.4	86.6	716,080	110
Ten Section.....	116	2,380,712	121.6	7.6	114	2,243,053	123.2	86.8	31,578,441	1,910
Wasco.....	13	450,498	210.2	43.0	13	372,253	177.0	87.9	3,779,853	260
Wheeler Ridge.....	34	46,180	7.6	21.7	34	45,144	7.3	98.9	4,228,995	275
Kern County:										
Ant Hill Area.....					2	17,130	76.5	60.9	17,130	70
Antelope Hills Area.....	1	497	27.6	8.1						
Bellevue Area.....	1	24,146	513.7	0.2	2	133,890	345.1	100.0	158,036	60
Dyer Creek Area.....	1	324	29.4	92.3						
Kern Bluffs Area.....	1	1,219	9.2	65.2	1	277	7.3	20.6	1,496	310
McClung Area.....	2	27,749	79.0	37.2	2	19,775	57.2	94.0	66,322	100
Shafter Area.....	1	5,609	34.8	44.0	1	261	2.4	58.7	54,575	20
Shale Hills Area.....	1	7,208	62.1	6.3						
Bowerbank Gas.....	42	0			41	0	0	0	0	1,360
Buttonwillow Gas.....	414	0			48	0	0	0	0	1,200
Semitropic Gas.....	49	0			46	0	0	0	0	1,600
Trieco Gas.....	420	0			420	0	0	0	0	5,840
Totals.....	9,524	43,654,686	26.8	71.9	9,916	49,052,219	28.6	94.0	2,072,774,279	113,860

DIST. 5—Coalinga	1,327	5,090,100	22.3	42.4	1,394	5,482,047	22.4	95.2	394,783,319	15,387
East Coalinga Extension	205	12,541,810	350.3	11.2	202	12,186,053	344.3	95.2	76,973,417	4,020
Helm	11	158,166	100.0	8.2	24	373,463	121.8	79.8	817,581	3,180
Jacalitos	17	109,803	40.4	2.5	25	216,639	50.2	93.8	2,505,185	795
Kettleman Middle Dome					0	0	0	0	552,036	0
Kettleman North Dome	271	7,567,228	174.4	31.5	277	7,567,544	165.3	89.8	295,975,674	12,690
Pleasant Valley	8	320,690	253.9	86.7	14	621,898	263.2	92.2	1,177,301	370
Pyramid Hills	4	22,090	34.2	88.7	10	46,426	28.6	88.0	73,838	130
Raisin City	18	369,808	124.1	91.0	26	558,876	127.3	91.8	1,678,220	730
Riverdale	34	596,712	110.0	87.6	45	927,803	120.5	93.0	2,223,962	1,540
Fresno County:										
Burrel Area					2	4,455	23.3	50.8	12,761	20
Cantua Creek Area	3	23,189	61.5	68.3	0	0	0	0	3,146	10
Cheney Creek Area					0	0	0	0	4,798	10
Eureka Gas	43	0			43	0	0	0	0	480
Fairfield Knolls Gas	0	0			41	0	0	0	0	240
Gill Ranch Gas	0	0			41	0	0	0	0	410
Marysville Buttes Gas	45	0			45	0	0	0	0	840
McDonald Island Gas	45	0			45	0	0	0	0	1,060
Rio Vista Gas	461	0			467	0	0	0	0	820,550
Roberts Island Gas	41	0			41	0	0	0	0	20
Tracy Gas	41	0			41	0	0	0	0	310
Vernalis Gas	42	0			42	0	0	0	0	100
Willows Gas	41	0			41	0	0	0	0	20
Butte County—Chico Area	0	0			0	0	0	0	0	20
Colusa County—Colusa Area	0	0			0	0	0	0	0	20
Glenn County—Afton Area	0	0			0	0	0	0	0	20
Ord Bend Area	0	0			0	0	0	0	0	180
Kings County—Trico Northwest Area	0	0			0	0	0	0	0	20
Madera County—Chowchilla Area	0	0			0	0	0	0	0	80
Moffatt Ranch Area	0	0			0	0	0	0	0	20
Sacramento County—Thornton Area	1	0			41	0	0	0	0	210
San Joaquin County—Thornton Area	41	0			0	0	0	0	0	940
Lodi Area		0			0	0	0	0	0	580
Solano County:										
Dixon Area					41	0	0	0	0	20
Honker Area	41	0			41	0	0	0	0	20
Suisun Area					41	0	0	0	0	40
Sonoma County—Petaluma Area					0	0	0	0	0	20
Tehama County—Corning Area					0	0	0	0	0	20
Totals	1,898	26,799,596	83.2	93.3	2,019	27,985,204	80.1	94.1	776,784,542	65,122
Grand totals	20,403	150,887,887			21,223	160,829,917	0	0	6,608,263,222	233,497
DIST. 1—Imperial Carbon Dioxide Gas	19				14	0	0	0	0	210

<sup>1</sup> Corrected figure.  
<sup>2</sup> Includes 497 barrels formerly carried under Kern County.  
<sup>3</sup> Includes 5,445 barrels formerly carried under Kern County.  
<sup>4</sup> Gas wells omitted from totals.  
<sup>5</sup> Includes 100 acres in San Luis Obispo County, District No. 3.  
<sup>7</sup> Includes 133,241 barrels formerly carried under Kern County.  
<sup>8</sup> Includes 730 acres in Contra Costa County, District No. 3.

CHAPTER THREE

METALS

*Bibliography:* Reports of State Mineralogist I-XXXIX (inc.). Bulletins 5, 6, 18, 23, 27, 36, 50, 57, 76, 78, 85, 92, 95, 108. Spurr and Wormser, "Marketing of Metals and Minerals." See also under each metal.

The value of metals produced in California during 1944 amounted to a total of \$24,040,256, as compared with \$27,703,118 in 1943. Increases in total values over that of 1943 were registered by copper, iron ore, lead, manganese ore, silver, and zinc; all other metals decreased. The value of gold was exceeded by that of tungsten ore in 1944, and in 1943 by quicksilver and tungsten ore; previously it lead all metals in value of output.

A comparison of the 1943 output with that of 1944 is afforded by the following table:

Substance	1943		1944		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Chromite.....	56,201 long tons	\$2,334,838	27,900 long tons	\$1,190,513	\$1,144,325—
Copper.....	17,172,440 lbs.	2,232,417	25,584,865 lbs.	3,453,957	1,221,540+
Gold.....	148,328 fine ozs.	5,191,480	117,373 fine ozs.	4,108,055	1,083,425—
Iron ore.....	907,458 tons	2,341,827	905,981 tons	2,360,694	18,867+
Lead.....	11,811,034 lbs.	885,827	11,408,381 lbs.	912,670	26,843+
Manganese ore.....	25,729 long tons	957,317	30,263 long tons	1,098,555	141,238+
Quicksilver.....	33,948 flasks	6,177,159	28,097 flasks	3,178,969	2,998,190—
Silver.....	609,075 fine ozs.	433,120	775,936 fine ozs.	553,910	120,790+
Tungsten ore.....	254,118 units	5,910,745	203,965 units	4,835,810	1,074,935—
Zinc.....	5,170,627 lbs.	558,427	16,456,103 lbs.	1,875,996	1,317,569+
Unapportioned.....	a	679,961	b	471,127	208,834—
Total values.....		\$27,703,118		\$24,040,256	
Net decrease.....					\$3,662,862

a Includes molybdenum ore, platinum group metals, and titanium ore.  
b Includes antimony, cadmium, molybdenum ore, tin ore, and titanium ore.

ALUMINUM

*Bibliography:* Report XVIII, p. 198, XXXVII. Bulletins 38, 67. U. S. Geol. Surv., Min. Res. of U. S.

To date there has been no commercial production of aluminum ore in California. Only a single authenticated occurrence of bauxite has thus far been noted in this State, being in Riverside County southeast of Corona, but as yet undeveloped.

Aluminum metal has been reduced in the State in two plants, one at Torrance in Los Angeles County which started production in 1942, and the other at Riverbank, Stanislaus County which went in to operation in May 1943. Both plants were closed down in August of 1944. These plants were constructed by the Defense Plant Corporation and operated by Aluminum Company of America. The ore from which the metal was made was South American bauxite, which was refined to alumina (aluminum oxide) in Mobile, Alabama, before being shipped to these plants.

Minerals containing aluminum are abundant, the most widely distributed being the clays. There are only two, however, thus far of consequence commercially, in the production of the metal; bauxite (to which may be added the related hydrated oxides, hydrargillite and diaspore) and cryolite. Cryolite is found in commercial quantities only in south Greenland, and was formerly the only ore of aluminum used, being still employed as a flux in the extraction of the metal. Bauxite has been for some years the most important source of aluminum and its salts. Its color varies from gray to red, according to the amount of iron present, the composition ranging usually between the following limits:  $\text{Al}_2\text{O}_3$ , 30%–60%;  $\text{Fe}_2\text{O}_3$ , 3%–25%;  $\text{SiO}_2$ , 0.5%–20%;  $\text{TiO}_2$ , 0.0–10%. Besides its reduction to the metal bauxite is also utilized in the manufacture of aluminum salts, refractories, alundum (fused alumina) for use as an abrasive, and in the refining of oil.

### ANTIMONY

*Bibliography:* State Mineralogist Reports VIII, X, XII–XV (inc.), XVII, XXII, XXIII, XXV–XXVII (inc.), XXXI, XXXIV, XXXVI. Bulletins 38, 91.

During 1944 in California there were two small shipments of antimony ore from a single property each in Inyo and Kern counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either operator. During 1943 there was no ore reported shipped.

Pure antimony metal and manufactured antimony compounds are of considerable importance as pigments in the ceramic industry. The most important use of the metal, commercially, is in various alloys, particularly type-metal (with tin and lead), babbitt (with tin and copper), and britannia metal (with tin and copper). An alloy of 6% antimony and 94% lead is being extensively used in making battery plates for storage batteries for automobiles, airplanes and radio apparatus.

Present New York quotations (Sept. 13, 1945) are around 16.5¢ per pound for Chinese (duty paid) and 15.839¢ for domestic antimony.

#### Antimony Production in California, by Years

The production of antimony ore in California by years since 1887 has been as follows:

Year	Tons	Value	Year	Tons	Value
1887.....	75	\$15,500	1918.....		
1888.....	100	20,000	1925.....		
1889.....			1926.....	*26	\$770
1893.....	50	2,250	1927.....	20	590
1894.....	150	6,000	1928.....	20	761
1895.....	33	1,485	1929.....		
1896.....	17	2,320	1939.....	150	4,552
1897.....	20	3,500	1940.....	*28	7,958
1898.....	40	1,200	1941.....	*10	2,537
1899.....	75	13,500	1942.....	*30	9,251
1900.....	70	5,700	1943.....		
1901.....	50	8,350	1944.....	*	*
1902.....	510	35,666			
1916.....	1,015	64,793	Totals.....	2,647	\$225,478
1917.....	158	18,786			

\* Annual details concealed under 'Unapportioned.'

\* Beginning 1940, amount of recoverable metal; before, tons of antimony ore shipped.

### ARSENIC

*Bibliography:* Reports XVIII, XXIII, XXV, XXX, XXXIII, XXXV. Bulletin 67. U. S. G. S., Min. Res. of U. S.

Arsenic is found in a number of localities in California in the mineral arsenopyrite ( $\text{FeAsS}$ ), which is frequently gold bearing; and in scorodite ( $\text{FeAsO}_4 + 2\text{H}_2\text{O}$ ), an oxidation product of arsenopyrite. The occurrence of realgar ( $\text{AsS}$ ) has also been noted.

Except for a small output in 1924, there has been no commercial recovery of arsenic from California ores. There having been only a single operator, the figures are concealed under the 'Unapportioned' item.

### BERYLLIUM

*Bibliography:* State Mineralogist Report XXVII, XXXV, XXXVI, Eng. & Min. Jour.-Press, Vol. 118, No. 8, p. 285, Aug. 23, 1924. U. S. Bureau of Mines Information Circular 6190.

Beryllium is a metal resembling aluminum closely in its chemical character. It has a specific gravity of 1.85, is almost as hard as quartz (will scratch glass) and will take a high polish. The use of beryllium as a metal is still more or less in the experimental stage because the cost of extracting the metal from its ores almost makes it prohibitive and the present sources of supply of the ore are limited. Not until such a time when deposits can be found that will assure a definite supply and metallurgical costs are such as to justify its use, will the metal be found in common use.

There are a number of beryllium minerals, but none have been found in commercial quantities, except beryl, which is beryllium-aluminum silicate. The chief use at present for ground beryl is as an addition to porcelain products, where it reduces the coefficient of expansion. Beryllium metal is difficult to separate from aluminum.

Present (Sept. 13, 1945) quotations for beryllium ore are per ton in carload lots, 8 to 12 percent  $\text{BeO}$  \$9 to \$10 per unit, f.o.b. mine.

Beryl occurs in California in the pegmatite dikes of the tourmaline gem district in northern San Diego and northwestern Riverside counties; and an occurrence has recently been noted in western Inyo County, but the quantity is as yet unproved. Thus far there have been no commercial shipments of beryl from California except for gem purposes (the pink and aquamarine varieties).

### BISMUTH

*Bibliography:* State Mineralogist Report XXXV. Bulletins 38, 67, 91. Am. Jour. Sci., 1903, Vol. 16.

During 1942, several hundred pounds of bismuth concentrates were made at a tungsten mine in Fresno County, but no shipments were made during the year.

Several bismuth minerals have been found in California, notably native bismuth and bismite (the ochre) in the tourmaline gem district in San Diego and Riverside counties near Pala. Other occurrences of bismuth minerals, including the sulphide, bismuthinite, have been noted in Inyo, Fresno, Nevada, Tuolumne, San Bernardino, and Mono counties,

but only in small quantities. The only commercial production recorded was 20 tons valued at \$2,400 in 1904, and credited to Riverside County.

The uses of bismuth are somewhat restricted, being employed principally in the preparation of medicinal salts, and in low melting-point or cliché alloys. These alloys are utilized in automatic fire sprinkler systems, in electric fuses, and in solders.

The present quotation (Sept. 13, 1945) for bismuth is \$1.25 per pound, in ton lots for the refined metal.

### CADMIUM

*Bibliography:* U. S. Geol. Surv., Min. Res. of U. S., 1908, 1918.

During 1944 cadmium metal was recovered from zinc ore shipped from the Big Bend Mine in Butte County, to the Sullivan Mining Company at Silver King, Idaho for reduction. In 1917 and 1918, cadmium was recovered by the electrolytic zinc plant of the Mammoth Copper Company in Shasta County. It was shipped in the form of 'sticks' and amounted to a total of several thousand pounds for the two years, the exact figures being concealed under 'Unapportioned.' That was the first commercial production of cadmium recorded from California ore. Cadmium occurs there associated with zinc sulphide, sphalerite. Cadmium also occurs in the Cerro Gordo Mines, Inyo County, associated with smithsonite (zinc carbonate).

Cadmium is produced in the United States in two forms—metallic cadmium and the pigment, cadmium sulphide. The principal use of the metal is in low-melting point, or cliché alloys, and its salts are utilized in the arts, medicine, and in electroplating. The sulphide is employed as a paint pigment, being a strong yellow, which is unaffected by hydrogen sulphide gas from coal smoke. It is also employed in coloring glass and porcelain. Cadmium cliché metal is stated to be superior to the corresponding bismuth alloy, for making stereotype plates. Cadmium is also used in bronze telegraph and telephone wires, and gives some promise of being utilized in electroplating.

The present quotation (Sept. 13, 1945) for cadmium is 90¢ per pound for the metal.

### CHROMITE

*Bibliography:* State Mineralogist Reports IV, XII, XIII, XIV, XV, XVII, XVIII, XXI-XXIX (inc.), XXXI, XXXIV-XXXIX (inc.). Bulletins 38, 76, 91. Preliminary Report 3. U. S. G. S., Bull. 430. Min. & Sci. Press, Vol. 114, p. 552.

During 1944 there was shipped from the California mines, a total of 28,811 long tons of chromite averaging 43.58 percent  $\text{Cr}_2\text{O}_3$ , which recalculated to a basis of 45 percent  $\text{Cr}_2\text{O}_3$  equals 27,900 long tons, and which was worth \$1,190,513 f.o.b. mine and came from 103 properties in 22 counties; compared with 57,741 long tons of ore shipped in 1943 averaging 43.8 percent  $\text{Cr}_2\text{O}_3$ , which recalculated to a basis of 45 percent  $\text{Cr}_2\text{O}_3$  equals 56,201 long tons, valued at \$2,334,838 f.o.b. mine and came from 151 properties in 21 counties; 47,521 long tons of ore shipped, 42.85 percent  $\text{Cr}_2\text{O}_3$ , which recalculated to a basis of 45 percent  $\text{Cr}_2\text{O}_3$  equals 45,253 long tons, valued at \$1,741,080 f.o.b. mine and came from

95 properties in 17 counties in 1942. Distributed by counties the 1942, 1943, and 1944 chromite output was as follows:

County	1942		1943		1944	
	Long tons equivalent 45%	Value	Long tons equivalent 45%	Value	Long tons equivalent 45%	Value
Butte.....	57	\$1,731	340	\$11,945	*	*
Del Norte.....	8,931	382,367	13,125	564,322	11,040	\$491,141
Humboldt.....	*	*	873	33,603	240	9,498
Placer.....	1,263	44,893	463	21,208	512	24,184
Plumas.....	*	*	488	22,265	70	2,808
Shasta.....	1,485	40,661	1,113	49,246	398	18,974
Siskiyou.....	2,298	93,625	4,917	200,328	2,225	89,650
Tehama.....	*	*	*	*	917	45,104
Trinity.....	1,019	38,820	592	7,587	76	3,133
Other counties*	*30,200	1,138,983	*34,280	1,424,334	*12,422	506,021
Totals.....	45,253	\$1,741,080	56,201	\$2,334,838	27,900	\$1,190,513

\* Combined to conceal the production of individual operators in each.

<sup>a</sup> Includes Calaveras, El Dorado, Fresno, Glenn, Humboldt, Mendocino, Plumas, San Luis Obispo, Sierra, Tehama, and Tuolumne counties.

<sup>b</sup> Includes Calaveras, El Dorado, Fresno, Glenn, Lake, Mendocino, Nevada, San Benito, San Luis Obispo, Sierra, Sonoma, Tehama, and Tuolumne counties.

<sup>c</sup> Includes Butte, Calaveras, Colusa, El Dorado, Fresno, Glenn, Lake, Napa, Nevada, San Luis Obispo, San Benito, Sierra, Sonoma, and Tuolumne counties.

The 1942 and 1943 statistics on chromite were not previously released owing to restrictions by the Office of War Information. The 1943 output was the largest in amount and value of chromite mined in California with the exception of that of 1918 when 66,031 long tons of ore were shipped, valued at \$3,694,497.

The chromite shipped in 1944 varied in grade from a shipment running as high as 55.18 per cent  $\text{Cr}_2\text{O}_3$  in San Benito County, down to one from Humboldt County running 32.18 per cent  $\text{Cr}_2\text{O}_3$ , and a large shipper's ore that averaged 52.97 per cent  $\text{Cr}_2\text{O}_3$  for the year; as compared with 1943 when ore shipped varied from 54 per cent  $\text{Cr}_2\text{O}_3$  coming from Placer County to a shipment of 32 per cent  $\text{Cr}_2\text{O}_3$  from El Dorado County, and a large shipper in Del Norte County whose ore averaged for the year 51.9 per cent  $\text{Cr}_2\text{O}_3$ ; and with 1942 when a shipment of ore as high as 58.2 per cent  $\text{Cr}_2\text{O}_3$  was made from Siskiyou County and as low as 32 per cent  $\text{Cr}_2\text{O}_3$  from El Dorado County, and with a large shipper in Del Norte County averaging for the year at 51 per cent  $\text{Cr}_2\text{O}_3$ .

California miners received an average of \$41.32 a long ton for chromite shipped during 1944, compared with \$40.44 a long ton for ore shipped in 1943 and \$36.64 a long ton for ore shipped in 1942.

#### Occurrence

Chromite is widely distributed in California, the principal production, thus far, having come from El Dorado, San Luis Obispo, Del Norte, Shasta, Siskiyou, Placer, Fresno, and Tuolumne counties. In 1918 a total of 29 counties contributed to the State's output. There are two main belts in California yielding this mineral, one along the Coast Ranges from San Luis Obispo County to the Oregon line, including the Klamath Mountains at the north end, and the other in the Sierra Nevada from Tulare County to Plumas County. Chromite occurs as lenses in basic igneous rocks such as peridotite and pyroxenite, and in serpentines which have been derived by alteration of such basic rocks.



## Uses

The major consumption of chromite ore is for use as a refractory lining in smelting furnaces for steel and copper. A smaller portion is used in the preparation of ferrochrome for chrome-steel alloys, and of chromium chemicals, the latest development of which is chrome plating as used in the automobile industry, on ships, and in oil refineries to protect metal surfaces from wear and erosion.

## Total Chromite Production of California

Production of chromite in California began, apparently in the period 1869-1873 in Del Norte County, followed by San Luis Obispo in 1874. There was considerable activity in San Luis Obispo from 1880 to 1883, inclusive, and a total of 23,238 long tons (or 26,028 short tons) valued at \$329,924 was shipped from that county up to the beginning of 1887. There are records of shipments from Sonoma County (before 1883), Placer County (1883 and 1884), and Calaveras County. Apparently the state's total in the period 1869-1883 was some 45,000 tons.<sup>1</sup> The tabulation herewith shows the output of chromite in California annually, including the earliest figures so far as they are available. The figures from 1887 to date are from the records of the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1869-1883			1913	1,180	\$12,700
Del Norte County	19,000	\$239,400	1914	1,517	9,434
Sonoma County			1915	3,725	38,044
Placer County			1916	48,943	717,244
Calaveras County			1917	52,379	1,130,298
1874-1887 (San Luis Obispo County)	26,028	329,924	1918	73,955	3,649,497
1887	3,000	40,000	1919	*4,314	97,164
1888	1,500	20,000	1920	1,770	43,031
1889	2,000	30,000	1921	347	6,870
1890	3,599	53,985	1922	379	6,334
1891	1,372	20,580	1923	84	1,658
1892	1,500	22,500	1924	350	6,700
1893	3,319	49,785	1925	191	3,712
1894	3,680	39,980	1926	393	7,063
1895	1,740	16,795	1927	225	5,063
1896	786	7,775	1928	729	15,179
1897			1929	327	5,025
1898			1930	84	1,905
1899			1931	441	6,737
1900	140	1,400	1932 <sup>a</sup>	1,206	16,587
1901	130	1,950	1933 <sup>a</sup>		
1902	315	4,725	1934	294	3,498
1903	150	2,250	1935	488	6,111
1904	123	1,845	1936	221	3,314
1905	40	600	1937	1,918	20,830
1906	317	2,859	1938	982	10,864
1907	302	6,040	1939	3,936	52,673
1908	350	6,195	1940	2,599	32,796
1909	436	5,309	1941	17,307	355,354
1910	749	9,707	1942	45,253	1,741,080
1911	935	14,197	1943	56,201	2,334,838
1912	1,270	11,260	1944	27,900	1,190,513
			Totals	422,421	\$12,471,727

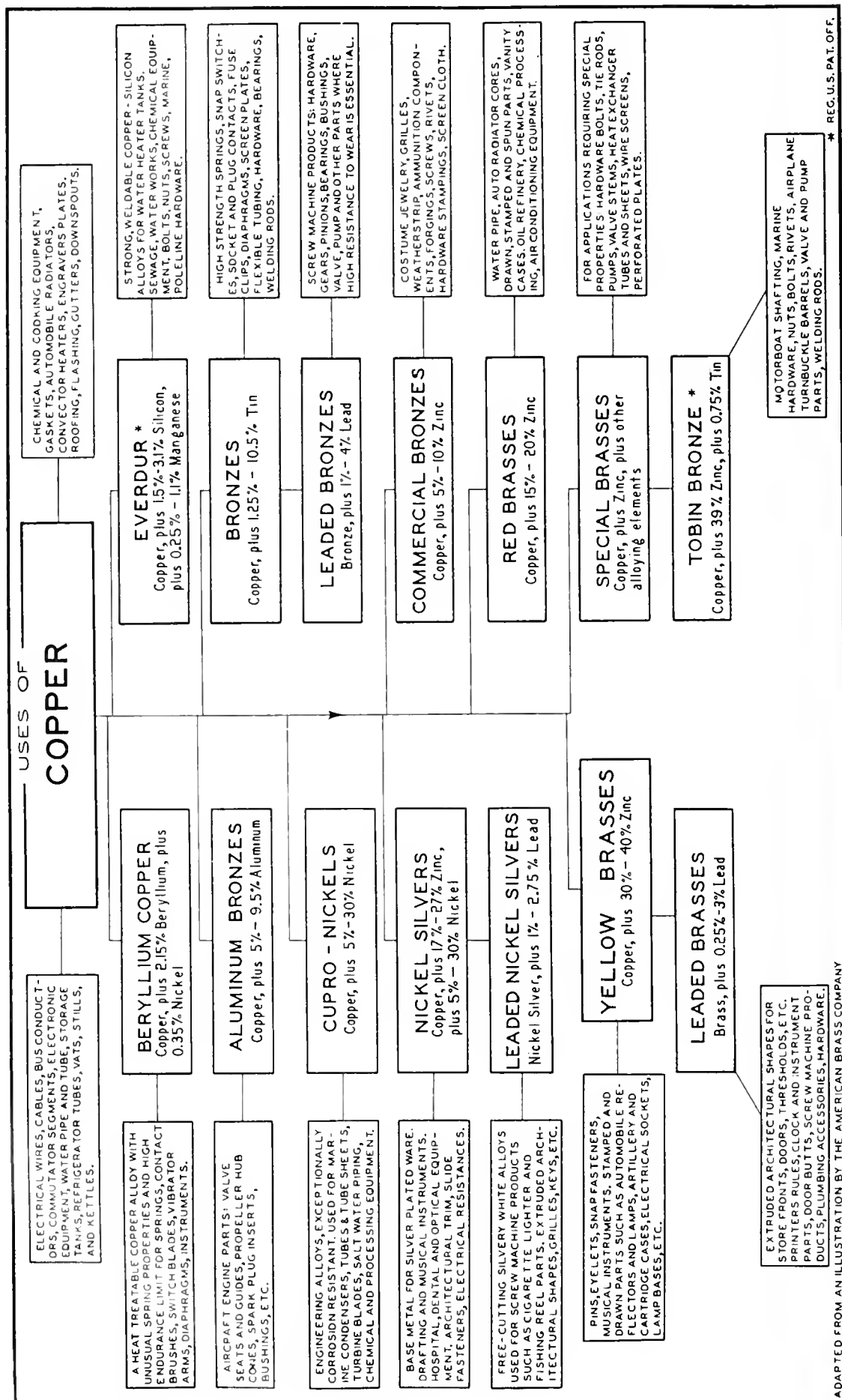
\* Recalculated to 45% Cr<sub>2</sub>O<sub>3</sub> beginning with 1919.

<sup>a</sup> Included under 'Unapportioned.'

<sup>1</sup> Day, D. T., Mineral Res. of the U. S. 1882-1884, U. S. G. S., pp. 569, 570, 1885.

## COBALT

*Bibliography:* Report XIV, XXXIII, XXXIV, XXXVII. Bulletins 67, 91. U. S. G. S., Min. Res. of U. S., 1912, 1918. U. S. B. M., I.C. 6331.



Occurrences of some of the cobalt minerals have been noted in several localities in California, but to date no commercial production has resulted. Some of the copper ores of the foothill copper belt in Mariposa and Madera counties have been found to contain cobalt up to 3%.

The nominal quotation for cobalt (August 10, 1944) is around 97 to 99% at \$2.11 per pound for the refined metal in small lots.

The most important use of cobalt is in the manufacture of the alloy, stellite, in which it is combined with chromium, for making high-speed lathe tools, and non-tarnishing cutlery and surgeons' appliances. The metal is also used in electroplating, similarly to nickel; and the oxide, carbonate, chloride, sulphate and other salts are used in ceramics for coloring. Some of the organic salts of cobalt (acetate, resinate, oleate) are employed as 'driers' in paint and varnish.

### COPPER

*Bibliography:* State Mineralogist Reports VIII-XXXIX (inc.).  
Bulletins 23, 50, 91.

The total output of copper in California during 1944 amounted to 25,584,856 pounds recoverable metal valued at \$3,453,957, and came from properties in 16 counties. This was an increase in both amount and value as compared with the 1943 figures which were 17,172,440 pounds worth \$2,232,417. The average price by miners including bonus for copper during 1944 was 13.5¢ per pound compared with 13.0¢ in 1943; 12.1¢ in 1942; 11.8¢ per pound in 1941; 11.3¢ per pound in 1940; 10.4¢ per pound in 1939; 9.8¢ in 1938; 12.1¢ in 1937; 9.2¢ in 1936; 8.3¢ in 1935; and 8.0¢ in 1934.

Distribution of the 1944 output of copper in California by counties was as follows:

County	Pounds	Value
Amador.....	440,962	\$59,530
Butte.....	464,858	62,756
Calaveras.....	4,952,034	668,524
El Dorado.....	52,658	7,109
Inyo.....	557,286	75,234
Madera.....	72,221	9,750
Mariposa.....	182,799	24,678
San Bernardino.....	390,634	52,736
Shasta.....	2,585,656	349,063
Siskiyou.....	15,856,568	2,140,637
Tuolumne.....	13,993	1,889
Alameda, Alpine, Kern, Nevada, Orange*	15,196	2,051
Totals.....	25,584,865	\$3,453,957

\* Combined to conceal output of producers in each.

According to the U. S. Bureau of Mines<sup>1</sup> the smelter production of primary copper from domestic sources during 1944 totaled 1,003,379 short tons compared with 1,092,939 short tons for 1943, or a decrease of approximately 8 percent. The average price of copper during the year as reported to the U. S. Bureau of Mines by selling agents was 11.8¢ per pound f.o.b. refinery but not including bonus payments of the Metal Reserve Company.

<sup>1</sup> U. S. Bureau of Mines Mineral Market Report MMS 1314, July 4, 1945.

Copper Production of California, by Years

Although some mining of copper ores in a small way had been done earlier, shipments in appreciable quantities began in 1861 and continued of importance up to the end of 1867, when a total of 68,631 tons (of 2376 pounds) of high-grade ores, and 847 tons of matte or ‘regulus’<sup>2</sup> had been shipped to smelters at New York, Boston, and Swansea, Wales. The most important district at that time was Copperopolis and vicinity in Calaveras County, with some shipments also made from Mariposa, El Dorado, Fresno and San Luis Obispo counties. From 1868 to 1882, the output was insignificant. There are wide discrepancies in the figures recorded for copper production previous to 1882, in which year the data of the U. S. Geological Survey began. The detailed statistics of the California State Mining Bureau began in the year 1894.

Amount and value of copper production in California annually since 1882 is given in the following tabulation :

Copper Production of California, by Years

Year	Pounds	Value	Year	Pounds	Value
1882	826,695	\$144,672	1914	30,491,535	\$4,055,375
1883	1,600,862	265,743	1915	40,968,966	7,169,567
1884	876,166	120,911	1916	55,809,019	13,729,017
1885	469,028	49,248	1917	48,534,611	13,249,948
1886	430,210	43,021	1918	47,793,046	11,805,883
1887	1,600,000	192,000	1919	22,162,605	4,122,246
1888	1,570,021	235,303	1920	12,947,299	2,382,303
1889	151,505	18,180	1921	12,088,053	1,559,358
1890	23,347	3,502	1922	22,883,987	3,090,582
1891	3,397,405	424,675	1923	28,346,860	4,166,989
1892	2,980,944	342,808	1924	52,089,349	6,823,704
1893	239,682	21,571	1925	46,968,499	6,669,527
1894	738,594	72,486	1926	33,521,544	4,693,014
1895	225,650	21,901	1927	27,350,316	3,582,888
1896	1,922,844	199,599	1928	25,162,304	3,623,360
1897	13,638,626	1,540,666	1929	33,809,258	5,941,799
1898	21,543,229	2,475,168	1930	26,534,752	3,449,522
1899	23,915,486	3,990,534	1931	12,954,842	1,178,890
1900	29,515,512	4,748,242	1932	1,417,536	89,307
1901	34,931,788	5,501,782	1933	992,515	63,521
1902	27,860,162	3,239,975	1934	590,638	47,252
1903	19,113,861	2,520,997	1935	2,031,836	168,645
1904	29,974,154	3,969,995	1936	9,991,799	919,245
1905	16,997,489	2,650,605	1937	10,512,500	1,272,013
1906	28,726,448	5,522,712	1938	1,613,491	158,122
1907	32,602,945	6,341,387	1939	8,390,215	872,582
1908	40,868,772	5,350,777	1940	12,833,363	1,450,170
1909	65,727,736	8,478,142	1941	8,101,449	955,970
1910	53,721,032	6,680,641	1942	2,138,149	258,716
1911	36,838,024	4,604,753	1943	17,172,440	2,232,417
1912	34,169,997	5,638,049	1944	25,584,865	3,453,957
1913	34,471,118	5,343,023	Totals	1,243,425,973	\$193,988,877

GOLD

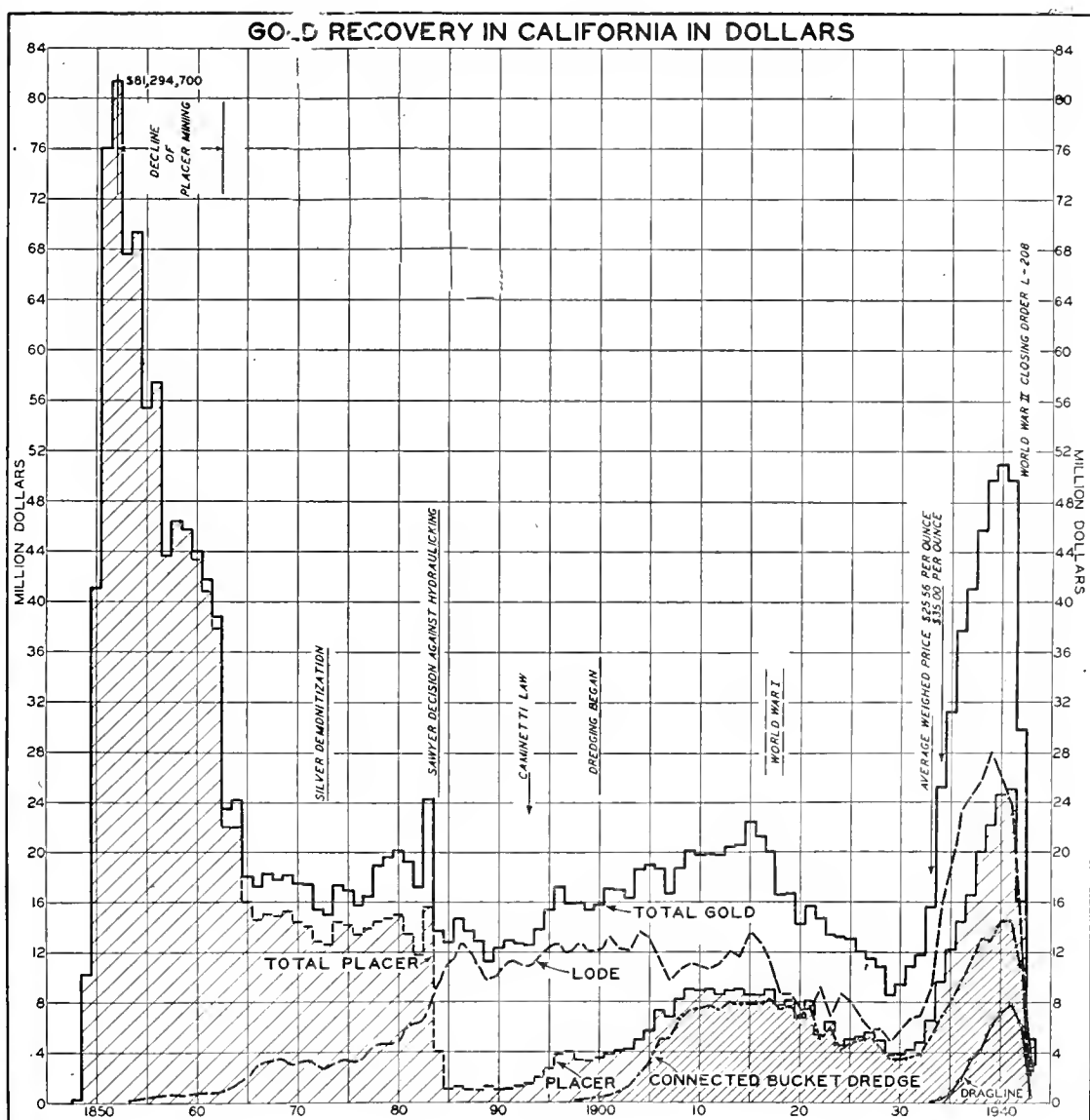
*Bibliography:* State Mineralogist Reports I to XXXIX (inc.), (except III and VIII). Bulletins 36, 45, 57, 91, 92, 95, 108. U. S. Geol. Surv., Prof. Paper 73. U. S. Bur. of Mines, Econ. Paper 3 (1929).

Gold was first, and, for many years, the most important single mineral product of California. Although now surpassed for a number of years in annual value by petroleum, and by natural gas from 1923

<sup>2</sup> Browne, J. Ross, Mineral Resources West of the Rocky Mountains, p. 168, 1867.

to 1932, and 1943; and headed the metal list till 1943 when it was passed in value by both quicksilver and tungsten ore; and tungsten ore only in 1944. Prior to 1943 California outranked all other gold producing states in the United States for many years.

There was a steady increase in the output of both lode and placer mines in California from 1928 to 1942, but in 1941 the value of placer production continued to increase, although that of lode dropped off 8 per cent and in 1942 a sharp decline in the yield of both lode and placer mines, first by the increased difficulty of obtaining supplies and labor and on October 8, 1942, the War Production Board's Order L-208, closing down most of the gold and silver mines in the State. During 1944 there were 109 operating lode properties and 66 placer properties, compared with 139 lode properties and 82 placer properties in 1943, but these did not include snipers, prospectors and various individuals selling gold in small lots to bullion dealers.



The production of gold in California during 1944 totaled 117,373 fine ounces valued at \$4,108,055, being a decrease of 30,955 fine ounces from the 1943 yield, which was 148,328 fine ounces worth \$5,191,480. In 1944 deep or lode mines accounted for 42,324 fine ounces worth

\$1,481,340, and placers (mainly bucket-line, drag-line, and power shovel dredges) produced 75,049 fine ounces worth \$2,626,715.

The 1940 output was the largest in value since 1856 and in amount since 1862. The 1939 lode output of gold was undoubtedly the largest in the history of the State, while the yield of 1944 was the smallest in both amount and value since 1848, the year that gold was discovered in California.

As the Division of Mines has never independently gathered the statistics of gold and silver production, these figures, as in former years, are published by cooperation with and through the courtesy of Charles White Merrill of the Division of Mineral Statistics, U. S. Bureau of Mines.

The leading four counties were Yuba, Sacramento, Nevada, and Butte, none of which reached the million dollar output. In 1943 for the first year since 1880, the year that a segregation of gold by counties was first made, that the value of this metal from Nevada or Amador was less than a million dollars; and that of Sacramento County since 1908. In 1941 there were 15 counties with a gold output worth more than a million dollars and in 1942 eight counties.

The gold from Nevada, Kern, Amador, Mariposa, Sierra, and Tuolumne counties is mainly from the lode or deep mines; while that from Butte, Sacramento, San Joaquin, and Yuba counties is almost entirely from dredges.

Distribution for the 1944 gold output by counties was as follows:

Counties	Mines producing <sup>1</sup>		Totals	
	Lode	Placer	Fine ounces	Value
Alpine.....	1	-----	15	\$525
Amador.....	5	(2)	734	25,690
Butte.....	2	8	10,635	372,225
Calaveras.....	9	3	1,933	67,655
Del Norte.....	-----	1	3	105
El Dorado.....	3	1	82	2,870
Fresno.....	-----	1	155	5,425
Humboldt.....	-----	3	23	805
Inyo.....	16	-----	2,571	89,985
Kern.....	9	4	1,291	45,185
Los Angeles.....	1	2	85	2,975
Madera.....	3	-----	20	700
Mariposa.....	12	1	5,489	192,115
Merced.....	-----	1	5	175
Mono.....	-----	1	9	315
Nevada.....	3	1	16,029	561,015
Orange.....	1	-----	51	1,785
Placer.....	1	5	407	14,245
Plumas.....	2	2	121	4,235
Sacramento.....	-----	3	23,789	\$32,615
San Bernardino.....	18	1	919	32,165
San Diego.....	1	-----	2	70
San Joaquin and Sierra <sup>3</sup> .....	4	4	8,262	289,170
Shasta.....	6	1	1,796	62,860
Siskiyou.....	5	7	3,682	128,870
Stanislaus.....	-----	2	5,066	177,310
Trinity.....	2	8	550	19,250
Tuolumne.....	5	2	5,796	202,860
Yuba.....	-----	4	27,853	974,855
Totals.....	109	66	117,373	\$4,108,055

<sup>1</sup> Excludes itinerant prospectors, snipers, high-graders, and others who gave no evidence of legal right to property.

<sup>2</sup> Output from property not classed as a "mine."

<sup>3</sup> Combined to conceal output of individual.

The following is quoted from the advance statement of gold in 1944 by courtesy of the U. S. Bureau of Mines,\* Department of the Interior:

"*Gold*†—An uninterrupted rise beginning in 1929 culminated in the production of \$50,948,485 in gold in 1940, the largest value since 1856. In 1941, however, a reaction set in that gained headway in 1942. By January 1943 monthly production had sunk to 16,425 fine ounces, and since that time it has fluctuated between that figure and a low of 8,547 ounces established in February 1943. The monthly fluctuations were narrower during 1944; the monthly average for the year was 9,781 ounces compared with a monthly average of 12,361 ounces for 1943. Compared with 1942, the decrease of 699,669 ounces (\$24,488,415) recorded in 1943 was greater in both quantity and value than that between any other two years in the State's history, not excluding 1852-53, 1854-55, and 1856-57, when flush placer output was failing; 1883-84, when the Sawyer Decision drastically reduced hydraulicking; and 1917-18, when World War I caused many operations to suspend or curtail output. The decrease of 30,955 ounces valued at \$1,083,425 in 1944 from 1943 seems small when the decrease of the two preceding years is considered.

"A study of the monthly production figures since January 1937 brings out some points that are obscure in the annual figures. The uninterrupted upward trend shown in the annual figures beginning in 1929 and culminating in 1940 is paralleled in the available monthly data. It will be noted, however, that a serious recession was experienced in July 1940 from which industry did not fully recover until November. This was caused by a labor strike at the Selby smelter and refinery of the American Smelting & Refining Co., which resulted in the postponement of many shipments of ore, concentrates, and bullion; the strike was called July 1, and work was resumed November 9. The peak reached in December 1940 may be attributed, at least in part, to the move-

Twenty-five leading gold-producing mines in California in 1944, in order of output

Rank	Mine	District	County	Rank in 1944	Operator	Source of gold
1	Yuba Unit.....	Yuba River.....	Yuba.....	1	Yuba Consolidated Gold Fields.....	Dredge
2	Natomas Co.....	Folsom.....	Sacramento	2	Natomas Co.....	Dredge
3	Empire Star mines.....	Grass Valley-Nevada City..	Nevada.....	6	Empire Star Mines Co., Ltd., and New Verde Mines Corp.....	Gold ore
4	Idaho Maryland-Brunswick.....	Grass Valley-Nevada City..	Nevada.....	(1)	Idaho Maryland Mines Corp.....	Gold ore
5	Feather River channel	Oroville.....	Butte.....	4	Golden Feather Dredging Co.....	Dragline
6	Eagle Shawmut.....	Mother Lode.....	Tuolumne..	5	Miller & Clemson.....	Gold ore
7	Tuolumne gold dredge	La Grange.....	Stanislaus..	7	Tuolumne Gold Dredging Corp.....	Dredge
8	Oroville dredge.....	Oroville.....	Butte.....	11	Oroville Gold Dredging Co.....	Dredge
9	Dakin (Gray Eagle).....	Klamath River.....	Siskiyou.....	14	Gray Eagle Copper Co.....	Copper ore
10	Mount Gaines.....	Hunter Valley.....	Mariposa.....	15	Mount Gaines Mining Co.....	Gold ore
11	Original Sixteen to One	Alleghany.....	Sierra.....	9	Original Sixteen to One Mine, Inc.....	Gold ore
12	Blue Moon.....	Hunter Valley.....	Mariposa.....	(1)	Red Cloud Mines, Inc.....	Zinc ore
13	Columbia No. 2.....	Resting Springs.....	Inyo.....	10	Shoshone Mines, Inc.....	Lead ore
14	Tropico.....	Mojave.....	Kern.....	56	Burton Rose, Inc.....	Gold ore
15	Quail Hill.....	West Belt.....	Calaveras..	18	G. Ivan Smith.....	Zinc ore
16	Penn.....	Campo Seco.....	Calaveras..	(1)	Eagle Shawmut Mine (Penn Division).....	Zinc ore
17	Big Bend.....	Yankee Hill.....	Butte.....	39	Hoeffling Bros.....	Zinc ore
18	Lower Comanche dredge.....	Comanche.....	San Joaquin	21	Gold Hill Dredging Co.....	Dredge
19	Central Eureka.....	Mother Lode.....	Amador.....	(1)	Central Eureka Mining Co.....	Gold ore
20	Kutras tract.....	Redding.....	Shasta.....	19	Columbia Construction Co., Inc.....	Nonfloat
21	Hornet.....	Flat Creek.....	Shasta.....	30	The Mountain Copper Co., Ltd.....	Copper ore
22	St. Jude.....	French Gulch.....	Shasta.....	(1)	St. Jude Mining Co.....	Gold ore
23	Roosevelt.....	Buckeye.....	San Bernardino..	(1)	Roosevelt Mines, Inc.....	Gold ore
24	Pine Tree and Josephine.....	Mother Lode.....	Mariposa.....	13	Pacific Mining Co.....	Gold ore
25	Schroeder group.....	East Belt.....	Mariposa.....	38	Schroeder, Odgers & Schroeder.....	Gold ore

<sup>1</sup> Not operated in 1943.

\* U. S. Bureau of Mines Mineral Year Book of 1944 (Chapter reprint) Gold, Silver, Copper, Lead and Zinc in California, pp. 5-7.

† Merrill, Charles White, War and Gold: Eng. and Min. Jour., vol. 146, No. 5, May 1945, pp. 86-89.

ment of material accumulated during the strike. Beginning with January 1941, however, the trend is unmistakably downward, and the rate of decline accelerates as the months pass. The downward plunge is arrested in October 1942 probably because many operations, closed by War Production Board Order L-208, made final clean-ups, which were shipped before the end of the month. At any rate, the decline in November and December 1942 put the curve back on the precipitous trend line shown during the few months preceding October. By January production had reached a level that permitted little further recession, and this low level has ruled throughout 1943 and 1944 with only a slight additional decline.

"The 25 leading gold-producing mines in California in 1944, listed in the foregoing table, yielded 90 percent of the total gold output of the State; the leading five mines produced 62 percent and the leading 10 mines 79 percent. Many changes have taken place in the list since 1943; and only eight of the mines listed in 1942 are on the 1944 list."

### Total Gold Production of California

The presence of gold in stream gravels near Los Angeles was known and worked in a small way by the Indians, at least as early as 1841,<sup>1</sup> and possibly 1820.<sup>2</sup> On March 2, 1844, Don Manuel Castanares, deputy for California to the Congress of Mexico, reported<sup>3</sup> to his government that placers near Los Angeles had produced up to December, 1843, a total of 2000 ounces of gold dust, most of which had been sent to the United States Mint at Philadelphia.

As the padres and the rancheros discouraged the quest of gold, this early, small production caused no particular excitement. It was not until James W. Marshall's finding of gold nuggets in the tail-race of Sutter's saw mill on the American River, January 24, 1848, was heralded abroad that the great rush began, and California became a commonwealth of first rank almost over night. There are, however, no authentic data on gold production prior to 1848, other than occasional, scattered references such as above quoted.

The following table was originally compiled by Chas. G. Yale, of the Division of Mineral Resources, U. S. Geological Survey, but for a number of years statistician of the California State Mining Bureau and the U. S. Mint at San Francisco. The authorities chosen for certain periods were: J. D. Whitney, State Geologist of California; John Arthur Phillips, author of "Mining and Metallurgy of Gold and Silver" (1867); U. S. Mining Commissioner R. W. Raymond; U. S. Mining Commissioner J. Ross Browne; Wm. P. Blake, Commissioner from California to the Paris Exposition, where he made a report on "Precious Metals" (1867); John J. Valentine, author for many years of the annual report on precious metals published by Wells, Fargo & Company's Express; and Louis A. Garnett, in the early days manager of the San Francisco refinery, where records of gold receipts and shipments were kept. Mr. Yale obtained other data from the reports of the director of the U. S. Mint and the director of the U. S. Geological Survey. The authorities referred to who were alive at the time of the original compilation of this table in 1894 were all consulted in person or by letter by Mr. Yale with reference to

<sup>1</sup> Hittell, T. H., History of California, Vol. II, p. 12, 1885.

<sup>2</sup> Bancroft, H. H., History of California, Vol. II, p. 417, 1886.

<sup>3</sup> Mercantile Trust Review of the Pacific, Vol. XIV, No. 2, p. 43, Feb. 15, 1925.



the correctness of their published data, and the final table quoted was then made up.

There was no premium paid on gold during 1932, the price being \$20.67 a fine ounce. On August 29, 1933, there was an executive order lifting the embargo on gold ores, concentrates, precipitates, and unretorted amalgam, followed on October 25, 1933, by another order instructing the Reconstruction Finance Corporation to buy newly-mined gold at a price fixed by the U. S. Treasurer which corresponded to the world price, all of which had an effect on the 1933 gold yield. On January 30, 1934, the Gold Reserve Act of 1934 was passed, followed by the President's proclamation of January 31, 1934, which fixed the weight of the gold dollar at 15 5/21 grains, nine-tenths fine. The value of gold thereby became \$35 a fine ounce. The average weighted value of gold per fine ounce in 1934 was \$34.95.

The figures for 1903-1923 (inclusive) are those prepared by the U. S. Geological Survey; and since by the U. S. Bureau of Mines:

Total Gold Production of California, 1848 to 1944

Year	Fine ounces	Value	Year	Fine ounces	Value
1848	11,866	\$245,301	1897	767,779	\$15,871,401
1849	491,072	10,151,360	1898	769,476	15,906,478
1850	1,996,586	41,273,106	1899	741,881	15,336,031
1851	3,673,512	75,938,232	1900	767,390	15,863,355
1852	3,932,631	81,294,700	1901	821,845	16,989,044
1853	3,270,803	67,613,487	1902	818,037	15,910,320
1854	3,358,867	69,433,931	1903	788,544	16,300,653
1855	2,684,106	55,485,395	1904	901,484	18,633,676
1856	2,782,018	57,509,411	1905	914,217	18,898,545
1857	2,110,513	43,628,172	1906	906,182	18,732,452
1858	2,253,846	46,591,140	1907	809,214	16,727,928
1859	2,217,829	45,846,599	1908	907,590	18,761,559
1860	2,133,104	44,095,163	1909	979,007	20,237,870
1861	2,026,187	41,884,995	1910	953,734	19,715,440
1862	1,879,595	38,854,668	1911	954,870	19,738,908
1863	1,136,897	23,501,736	1912	953,640	19,713,478
1864	1,164,455	24,071,423	1913	987,187	20,406,958
1865	867,405	17,930,858	1914	999,113	20,653,496
1866	828,367	17,123,867	1915	1,085,646	22,442,296
1867	883,591	18,265,452	1916	1,035,745	21,410,741
1868	849,265	17,555,867	1917	971,733	20,087,504
1869	881,830	18,229,044	1918	799,588	16,528,953
1870	844,537	17,458,133	1919	807,667	16,695,955
1871	845,493	17,477,885	1920	692,297	14,311,043
1872	748,951	15,482,194	1921	759,721	15,704,822
1873	726,554	15,019,210	1922	709,678	14,670,346
1874	835,186	17,264,836	1923	647,210	13,379,013
1875	816,377	16,876,009	1924	636,140	13,150,175
1876	735,169	15,610,723	1925	632,035	13,065,330
1877	798,249	16,501,268	1926	576,798	11,923,481
1878	911,343	18,839,141	1927	564,586	11,671,018
1879	949,439	19,626,654	1928	521,740	10,785,315
1880	968,986	20,030,761	1929	412,479	8,526,703
1881	929,920	19,223,155	1930	457,200	9,451,162
1882	829,458	17,146,416	1931	523,135	10,814,162
1883	1,176,329	24,316,873	1932	569,167	11,765,726
1884	657,900	13,600,000	1933	<sup>a</sup> 613,579	15,683,075
1885	612,478	12,661,044	1934	<sup>b</sup> 719,064	25,131,284
1886	711,911	14,716,506	1935	<sup>c</sup> 890,430	31,165,050
1887	657,349	13,588,614	1936	1,077,442	37,710,470
1888	616,000	12,750,000	1937	1,174,578	41,110,230
1889	542,425	11,212,913	1938	1,311,129	45,889,515
1890	595,486	12,309,793	1939	1,435,264	50,234,240
1891	615,759	12,728,869	1940	1,455,671	50,948,485
1892	608,166	12,571,900	1941	1,408,793	49,307,755
1893	606,664	12,538,780	1942	847,997	29,679,895
1894	670,636	13,863,282	1943	148,328	5,191,480
1895	741,798	15,334,317	1944	117,373	4,108,055
1896	831,158	17,181,562			
			Totals	101,381,369	\$2,250,395,616

<sup>a</sup> Value calculated at an average weighted price of \$25.56 per fine ounce; previously \$20.6718.

<sup>b</sup> Value calculated at an average weighted price of \$34.95 per fine ounce.

<sup>c</sup> Value \$35 per fine ounce, beginning 1935.

## IRIDIUM (see under Platinum)

## IRON ORE

*Bibliography:* State Mineralogist Reports II, IV, V, X, XII-XV (inc.), XVII, XVIII, XXI-XXVII (inc.), XXX, XXXI, XXXIII-XXXVI (inc.), XXXIX. Bulletins 38, 67, 91. Am. Inst. Min. Eng., Trans. LIII. Min. & Sci. Press, Vol. 115, pp. 112, 117-122; Vol. 123, pp. 94-96, 113-114.

The iron ore shipped in California during 1944 totaled 905,981 net tons, valued at \$2,360,694 f.o.b. mine, and came from one property each in San Bernardino, Santa Cruz, and Shasta counties. The above figures showed a slight decrease in amount with an increase in value as compared with the 1943 output of 907,458 net tons, worth \$2,341,827.

The ore mined during the year was hematite from San Bernardino County which went to the new steel plant at Fontana and was also used in the manufacture of high-iron cement; magnetite from Shasta County and magnetite sands from Santa Cruz County, both used as an aggregate in heavy concrete for ballast.

There are considerable deposits of iron ore known in California, notably in Shasta, Madera, Placer, Plumas, Riverside, San Bernardino, and Los Angeles counties, but production has so far been limited for lack of an economic supply of coking coal. Some pig iron was made in the earlier years, utilizing charcoal for fuel, both in blast furnaces and by electrical reduction; also, ferrochrome, ferromanganese, and ferrosilicon have been made in California.

## Iron Ore Production in California, by Years

Total iron ore production of California, with annual amounts and values, is as follows:

Year	Tons	Value	Year	Tons	Value
1881*-----	9,273	\$79,452	1921-----	1,970	\$12,030
1882-----	2,073	17,766	1922-----	3,588	18,868
1883-----	11,191	106,540	1923-----	3,102	18,665
1884-----	4,352	40,983	1924-----		
1885-----			1925/a-----	785	4,710
1886-----	3,676	19,250	1926-----		
1887-----			1927/a-----	5,272	26,000
1893-----	250	2,000	1928-----		
1894-----	200	1,500	1930-----		
1895-----			1931/a-----	100	700
1907-----	400	400	1932-----		
1908-----			1934-----		
1909-----	108	174	1935/a-----	38,339	163,714
1910-----	579	900	1936-----	31,084	155,434
1911-----	558	558	1937-----	5,490	29,340
1912-----	2,508	2,508	1938-----	27,878	141,406
1913-----	2,343	4,485	1939-----	16,990	77,788
1914-----	1,436	5,128	1940-----		
1915-----	724	2,584	1941/a-----	54,707	194,362
1916-----	3,000	6,000	1942-----	99,092	371,562
1917-----	2,874	11,496	1943-----	907,458	2,341,827
1918-----	3,108	15,947	1944-----	905,981	2,360,694
1919-----	2,300	13,796			
1920-----	5,975	40,889	Totals-----	2,158,824	\$6,389,156

\* Productions for the years 1881-1886 (inc.) were reported as "tons of pig iron" (U.S.G.S., Min. Res. 1885), and for the table herewith are calculated to "tons of ore" on the basis of 47.6% Fe as shown by an average of analyses of the ores (State Mineralogist Report IV, p. 242). This early production of pig iron was from the blast furnaces then in operation at Hotelling in Placer County. Charcoal was used in lieu of coke. Though producing a superior grade of metal, they were obliged finally to close down, as they could not compete with the cheaper English and eastern United States iron brought in by sea to San Francisco.

<sup>a</sup> Annual details concealed under 'Unapportioned.'

## LEAD

*Bibliography:* State Mineralogist Reports IV, VIII-XV (inc.), XVII-XXVIII (inc.), XXX, XXXI, XXXIII-XXXVI (inc.), XXXIX.

The output of lead in California during 1944 came from eleven counties and amounted to a total of 11,408,381 pounds of recoverable metal valued at \$912,670, as compared with 11,811,034 pounds worth \$885,827 in 1943. The average price received for lead, including bonas, in 1944 was 8¢ per pound, compared with 7.5¢ in 1943; 5.7¢ per pound in 1941; 5.0¢ per pound in 1940; 4.7¢ per pound in 1939; 4.6¢ per pound in 1938; 5.9¢ per pound in 1937; and 4.6¢ per pound in 1936.

Distribution of the 1944 output of lead by counties was as follows:

County	Pounds	Value
Butte.....	56,209	\$4,497
Calaveras.....	191,233	15,298
Inyo.....	10,060,151	804,812
Kern.....	7,142	571
Mariposa.....	255,657	20,453
Orange.....	36,464	2,917
San Bernardino.....	299,278	23,942
Shasta.....	500,509	40,041
Amador, El Dorado, Nevada*.....	1,738	139
• Totals.....	11,408,381	\$912,670

\* Combined to conceal the output of individual operators in each.

#### Lead Production of the United States

According to data issued by the U. S. Bureau of Mines <sup>1</sup> during 1944, the production of primary lead from domestic ores in the United States was 494,443 net tons valued at \$50,489,000, being a decrease in amount and value from 1943 when 406,544 net tons of lead from domestic ores worth \$52,038,000 was produced. During 1944 there were 722,820 short tons of refined lead consumed in the United States, compared with 675,465 short tons in 1943.

#### Lead Production of California, by Years

Statistics on lead production in California were first compiled by this Bureau in 1887. Amount and value of the output, annually, with total figures, to date, are given in the following table:

<sup>1</sup> U. S. Bureau of Mines, Mineral Market Notes 1317, July 6, 1945.

## Lead Production of California, by Years

Year	Pounds	Value	Year	Pounds	Value
1877	<sup>a</sup> 7,836,000	\$391,800	1912	1,370,067	\$61,653
1878	8,640,000	328,320	1913	3,640,951	160,202
1879	4,502,000	191,335	1914	4,697,400	183,198
1880	4,200,000	215,460	1915	4,796,299	225,426
1881	6,680,000	325,316	1916	12,392,031	855,049
1882	<sup>b</sup> 4,000,000	196,800	1917	21,651,352	1,862,016
1883	<sup>c</sup> 3,400,000	145,520	1918	13,464,869	956,006
1884	3,200,000	120,512	1919	4,139,562	219,397
1885	2,000,000	80,900	1920	4,903,738	392,300
1886	2,000,000	93,400	1921	1,149,051	51,707
1887	<sup>d</sup> 1,160,000	52,200	1922	6,511,280	358,120
1888	900,000	38,250	1923	9,934,522	695,416
1889	940,000	35,720	1924	4,984,387	398,751
1890	800,000	36,000	1925	7,352,422	639,661
1891	1,140,000	49,020	1926	8,067,873	645,429
1892	1,360,000	54,400	1927	2,748,440	173,151
1893	666,000	24,975	1928	1,882,795	109,102
1894	950,000	28,500	1929	1,428,777	90,014
1895	1,592,400	49,364	1930	3,542,796	176,241
1896	1,293,500	38,805	1931	3,934,240	245,568
1897	596,000	20,264	1932	2,418,626	72,480
1898	655,000	23,907	1933	772,463	28,583
1899	721,000	30,642	1934	804,911	29,655
1900	1,040,000	41,600	1935	1,142,405	45,695
1901	720,500	28,820	1936	1,098,545	50,533
1902	349,440	12,230	1937	2,402,110	141,724
1903	110,000	3,960	1938	1,003,096	46,142
1904	124,000	5,270	1939	1,061,294	49,880
1905	533,680	25,083	1940	3,092,636	154,632
1906	338,718	19,307	1941	6,900,851	393,348
1907	328,681	16,690	1942	10,329,176	692,054
1908	1,124,483	46,663	1943	11,811,034	885,827
1909	2,685,477	144,897	1944	11,408,381	912,670
1910	3,016,902	134,082			
1911	1,403,839	63,173	Totals	247,845,900	\$14,914,815

<sup>a</sup> Quantities for 1877-1881 (inc.) from C. E. Siebenthal, Mineral Resources of U. S. 1912, Part I, U. S. Geol. Survey, p. 339; and values for same years from quotations in Eng. & Min. Jour., New York.

<sup>b</sup> Estimated.

<sup>c</sup> Quantities and values for 1883-1886 (inc.) from Mineral Resources of U. S. Geol. Surv., 1883-1886, respectively.

<sup>d</sup> Data from 1887 to date from reports of California State Mining Bureau.

## MANGANESE

*Bibliography:* State Mineralogist Reports XII-XV (inc), XVIII, XXII-XXVII (inc.), XXIX-XXXI, XXXIII-XXXIX (inc.). Bulletins 38, 67, 76, 91. U. S. G. S. Bull. 427. Eng. & Min. Jour.-Press, Vol. 117, p. 545.

Shipments of manganese ore during 1944 from 67 properties in 20 counties amounted to 34,282 long tons of an average grade of 39.72 percent Mn, which recalculated to a basis of 45 percent Mn, would equal 30,263 long tons, and was valued at \$1,098,555; compared with shipments from 58 properties in 24 counties in 1943, totaling 31,432 long tons of an average grade of 36.84 percent Mn, which recalculated to a basis of 45 percent Mn, would equal 25,729 long tons, and worth \$957,317; and with 1942 when 21,069 long tons of an average grade of 37.08 percent Mn were shipped from 53 properties in 20 counties, which recalculated to a basis of 45 percent Mn would equal 17,362 long tons, and was worth \$505,190.

The 1942 and 1943 manganese data were not previously released owing to restrictions by the Office of War Information.

The 1942, 1943, and 1944 shipments by counties were as follows:

County	1942		1943		1944	
	Long tons <sup>d</sup>	Value	Long tons <sup>d</sup>	Value	Long tons <sup>d</sup>	Value
Alameda.....	*	*	76	\$3,062	*	*
Amador.....	*	*	280	16,705	*	*
San Bernardino.....	*	*	1,588	36,596	2,802	\$67,075
San Joaquin.....	*	*	1,082	43,205	*	*
San Luis Obispo.....	*	*	388	18,233	725	33,302
Stanislaus.....	5,500	\$165,722	7,840	355,131	5,711	213,293
Trinity.....	2,620	94,020	4,266	180,984	9,753	367,960
Other counties.....	9,242	<sup>a</sup> 245,448	10,303	<sup>b</sup> 303,401	11,272	<sup>c</sup> 416,925
Totals.....	17,362	\$505,190	25,729	\$957,317	30,263	\$1,098,555

\* Combined to conceal the output of individuals in each.

<sup>a</sup> Includes properties in Alameda, Amador, Imperial, Humboldt, Lake, Marin, Mariposa, Mendocino, Nevada, Mono, Plumas, Riverside, San Bernardino, San Joaquin, San Luis Obispo, Santa Clara, Sonoma, and Tulare counties.

<sup>b</sup> Includes properties in Calaveras, Humboldt, Imperial, Inyo, Lake, Marin, Mariposa, Mendocino, Nevada, Placer, Plumas, Riverside, San Benito, Santa Clara, Shasta, Siskiyou, and Tulare counties.

<sup>c</sup> Includes properties in Alameda, Amador, Colusa, Glenn, Humboldt, Imperial, Marin, Mendocino, Nevada, Plumas, Riverside, San Joaquin, Santa Clara, Shasta, Siskiyou, and Sonoma counties.

<sup>d</sup> Long tons recalculated to 45% Mn.

The manganese ores shipped in 1944 varied in grade from one of 55.71 percent Mn for Plumas County and one of 55.31 percent Mn from Amador County to 17 percent Mn from San Bernardino County, and two large producers in Trinity County whose ores shipped during the year both averaged over 52 percent Mn. In 1943 ore shipped varied from shipments from one property that averaged 56.36 percent Mn to one as low as 14.03 percent Mn from Tulare County; and in 1942 the grades of ore shipped varied from a property in Trinity County whose ore averaged 53.26 Mn for the year to one in San Bernardino County with ore shipments running 19 percent Mn.

The average received by California miners for ore shipped in 1944 was \$32.04 a long ton f.o.b. mine, compared with \$30.46 a long ton f.o.b. mine in 1943; and \$23.10 a long ton f.o.b. mine in 1942.

#### Manganese Ore Production in California, by Years

Production of manganese ore in California began at the Ladd Mine, San Joaquin County, in the Telsa District in 1867. When shipments of this ore to England ceased late in 1874, upwards of 5000 tons had been produced by that property. For some years following that, the output was small. The tabulation herewith shows California's output of manganese ore, annually, since 1887, when the compilation of such figures was begun by the State Mining Bureau:

## Manganese Production in California by Years

Year	Tons	Value	Year	Tons	Value
1887	1,000	\$9,000	1915	4,013	\$49,098
1888	1,500	13,500	1916	13,404	274,601
1889	53	901	1917	15,515	396,659
1890	386	3,176	1918	26,075	979,235
1891	705	3,830	1919	11,569	451,422
1892	300	3,000	1920	2,892	62,323
1893	270	4,050	1921	1,005	12,210
1894	523	5,512	1922	540	7,650
1895	880	8,200	1923	690	10,620
1896	518	3,415	1924	1,115	25,785
1897	504	4,080	1925	832	19,450
1898	440	2,102	1926	235	4,700
1899	295	3,165	1927		
1900	131	1,310	1928		
1901	425	4,405	1929*	733	8,216
1902	870	7,140	1930		
1903	1	25	1931*	207	2,576
1904	60	900	1932		
1905			1934		
1906	1	30	1935/*	432	4,630
1907	1	25	1936		
1908	321	5,785	1939	6	45
1909	3	75	1940	314	3,206
1910	265	4,235	1941	3,565	75,057
1911	2	40	1942	17,362	505,190
1912	22	400	1943	25,729	957,317
1913			1944	30,263	1,098,555
1914	150	1,500			
			Totals	166,122	\$4,938,400

\* Annual details concealed under 'Unapportioned.'

## MOLYBDENUM

*Bibliography:* State Mineralogist Reports XIV, XVII-XXIV (inc.), XXVI-XXVIII (inc.), XXX, XXXIV-XXXVI (inc.). Bulletins 67, 91. U. S. Bur. of Min., Bulletin 111. Proc. Colo. Sci. Soc., Vol. XI.

Molybdenum is used as an alloy constituent in the steel industry, and in certain forms of electrical apparatus. Included in the latter is its successful substitution for platinum and platinum-iridium in electric contact-making and -breaking devices. In alloys it is used similarly to and in conjunction with chromium, cobalt, iron, manganese, nickel, tungsten and vanadium. The oxides and the ammonium salt have important chemical uses.

The two principal molybdenum minerals are: the sulphide, molybdenite, and wulfenite, lead molybdate; the former furnishing practically the entire commercial output. Molybdenite is found in or associated with acidic igneous rocks, such as granite and pegmatite.

Deposits of disseminated molybdenite are known in several localities in California, and in at least two places it occurs in small masses associated with copper sulphides. The first recorded commercial shipments of molybdenum ore in California were during the war, 1916-1918. Some development work has been done on a high-grade deposit at the head of the Kaweah River, Tulare County.

During 1944 there were shipments of molybdenum concentrates in California coming from a tungsten mine in Inyo County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual producer. The 1943 output was the largest annual yield.

The growing consumption of molybdenum by alloy-steel makers in the United States has been stimulated by the fact that molybdenum alone of the steel-alloying metals can be produced commercially in the United States to an extent which avoids all necessity for importation. Another fact has been the marked adaptability of molybdenum steels to large-scale production of automobile and other parts.

The present (Sept. 13, 1945) quotations on molybdenum ores are 45¢ per pound of  $\text{MoS}_2$  contained, f.o.b. mine, and on ferromolybdenum are 95¢ per pound Mo, 55%-65% Mo f.o.b. shipping point.

#### Molybdenum Production of California, by Years

California's production of molybdenum ore by years is summarized in the following tabulation:

Year	Pounds of $\text{MoS}_2$	Value
1916	9,280	\$9,945
1917	7,290	9,014
1918		
1919	270	300
1933)	1,306	306
1934)		
1939)	383,233	147,126
1940)		
1941)	3,775,566	1,228,203
1942)		
1943)	*	*
1944)		
Totals	4,176,945	\$1,294,894

<sup>a</sup> Annual details concealed under 'Unapportioned.'

#### NICKEL

*Bibliography:* State Mineralogist Reports XIV, XVII, XXIV, XXV, XXVIII, XXX, XXXIV-XXXVI (inc.) XXXIX. U. S. G. S., Bulletin 640-D. U. S. Bureau of Standards, Circular 100.

Nickel occurs in the Friday Copper Mine in the Julian District, San Diego County. The ore is a nickel-bearing pyrrhotite, with some associated chalcopyrite. Some ore has been mined in the course of development work but not treated nor disposed of, as they were unable to get any smelter to handle it for them. Nickel ore has also been reported from other localities in California, but not yet confirmed.

Present (June 11, 1942) quotations for nickel are around 35¢ per pound for the refined metal.

OSMIUM (see under Platinum)

PALLADIUM (see under Platinum)

#### PLATINUM GROUP METALS

*Bibliography:* State Mineralogist Reports IV, VIII, IX, XII-XXVI (inc.), XXVIII, XXX, XXXI, XXXIV-XXXVII (inc.). Bulletins 38, 45, 67, 85, 91, 92. U. S. Geol. Surv., Bulletins 193, 285. Trans. Am. Inst. Min. Eng., Vol. 47, pp. 217-218.

In California the platinum-group metals are obtained as a by-product from placer operations for gold. The major portion of it comes

from the dredges working in Amador, Butte, Merced, Sacramento, Stanislaus, Shasta, Trinity and Yuba counties, with a small amount coming from the hydraulic and surface sluicing mines of Del Norte, Humboldt, Siskiyou and Trinity counties.

During 1944 there were no platinum metals reported shipped from California mines, and for the first time since 1887, the year that production data began in this State. This was due to the shut-down of the gold mines.

Present quotations <sup>1</sup> (Sept. 13, 1945) are, platinum \$35 a fine ounce; iridium \$90 to \$100 per fine ounce; osmium per fine ounce, \$50; palladium per fine ounce, \$24; ruthenium per fine ounce \$35; rhodium per fine ounce, \$125.

Platinum Production of California, by Years

The annual production and values since 1887 have been as follows:

Year	Ounces	Value	Year	Ounces	Value
1887.....	416	\$10,400	1917.....	610	\$43,719
1888.....	100	400	1918.....	571	42,788
1889.....	500	2,000	1919.....	*418	60,611
1890.....	500	2,000	1920.....	477	68,977
1891.....	600	2,500	1921.....	613	58,754
1892.....	100	500	1922.....	795	90,288
1893.....	80	440	1923.....	602	78,546
1894.....	75	517	1924.....	273	36,452
1895.....	100	600	1925.....	292	39,937
1896.....	150	900	1926.....	322	32,005
1897.....	162	944	1927.....	139	10,749
1898.....	150	900	1928.....	312	27,902
1899.....	300	1,800	1929.....	212	14,416
1900.....	300	1,800	1930.....	217	11,700
1901.....	400	2,500	1931.....	305	11,979
1902.....	250	3,200	1932.....	278	8,142
1903.....	39	468	1933.....	236	7,255
1904.....	70	1,052	1934.....	424	14,884
1905.....	123	1,849	1935.....	121	4,153
1906.....	200	3,320	1936.....	1,000	40,669
1907.....	91	1,647	1937.....	530	23,704
1908.....	300	6,255	1938.....	1,069	35,150
1909.....	706	13,414	1939.....	896	32,135
1910.....	337	8,386	1940.....	1,358	62,419
1911.....	511	14,873	1941.....	909	40,590
1912.....	603	19,731	1942.....	941	41,927
1913.....	368	17,738	1943.....	834	40,662
1914.....	463	14,816	1944.....		
1915.....	667	21,149			
1916.....	886	42,642	Totals.....	24,295	\$1,179,25

\* Fine ounces, beginning with 1919.

<sup>1</sup> E. & M. J., Metal and Mineral Markets, Aug. 10, 1944.



## QUICKSILVER

*Bibliography:* State Mineralogist Reports IV, V, XII-XV, XVII-XXIX (inc.), XXXI, XXXIII-XXXVII (inc.). Bulletins 27, 78, 91. U. S. Geol. Surv., Monograph XIII. U. S. Bur. of Mines, Tech. Papers 96, 227; Bulletin 222, 335.

The production of quicksilver in California during 1944 totaled 28,097 flasks, valued at \$3,178,969 f.o.b. mine, and came from 63 properties in 14 counties; as compared with 33,948 flasks, worth \$6,177,159 in 1943, which came from 86 properties in 17 counties. The 1943 and 1944 outputs, distributed by counties were as follows:

County	1943		1944	
	Flasks 76 lbs.	Value	Flasks 76 lbs.	Value
Fresno.....	32	\$5,930		
Lake.....	4,206	774,813	3,781	\$403,317
Napa.....	2,023	363,017	1,176	128,570
San Luis Obispo.....	2,625	478,442	921	104,760
Santa Clara.....	1,736	322,871	*	*
Sonoma.....	4,121	761,654	*	*
Colusa, Contra Costa, Del Norte, Inyo, Kings, Monterey, San Benito, Santa Barbara, Siskiyou, Trinity, Yolo*	19,205	3,470,432		
Contra Costa, Del Norte, Inyo, Mono, Monterey, San Benito, Santa Barbara, Santa Clara, Sonoma, Trinity, Yolo*			22,219	2,515,452
Totals.....	33,948	\$6,177,159	28,097	\$3,178,969

\* Combined to conceal production of individual operators in each.

The 1943 output of quicksilver had the highest annual value ever recorded in the past 93 years in which a record had been kept of its production in California, and was the largest in amount since 1883. The 1944 California production was the largest of any State in the United States and was approximately 75 per cent of the national yield. During 1944 the average New York quotation on quicksilver was \$118.36 per 76-pound flask, while the average amount received by the California miner was \$113.14 per 76-pound flask; as compared with the 1943 average New York quotation of \$195.21 per 76-pound flask and the average price of \$181.96 paid to the California miner.

#### Total Quicksilver Production of California

Total amount and value of the quicksilver production of California, as given in available records, are shown in the following tabulation. Though the New Almaden Mine in Santa Clara County was first worked in 1824, and was in practically continuous operation from 1846 to 1921 (the yield being small the first two years), there are no available data on the output earlier than 1850. Previous to June, 1904, a 'flask' of quicksilver contained 76½ pounds; then 75 pounds up to and including 1927; beginning with 1928, 76 pounds. In compiling this table the following sources of information were used: for 1850-1883, table by J. B. Randol, in Report of State Mineralogist IV, p. 336; 1883-1893, U. S. Geological Survey reports; 1894 to date, statistical bulletins of the State Mining Bureau; also State Mining Bureau, Bulletin 27, "Quicksilver Resources of California," 1908, p. 10.

## Quicksilver Production of California, by Years

Year	Flasks	Value	Average price per flask	Year	Flasks	Value	Average price per flask
1850.....	7,723	\$768,052	\$99 45	1898.....	31,092	\$1,188,626	\$38 23
1851.....	27,779	1,859,248	66 93	1899.....	29,454	1,405,045	47 70
1852.....	20,000	1,166,600	58 33	1900.....	26,317	1,182,786	44 94
1853.....	22,284	1,235,648	55 45	1901.....	26,720	1,285,014	48 46
1854.....	30,004	1,663,722	55 45	1902.....	29,552	1,276,524	43 20
1855.....	33,000	1,767,150	53 55	1903.....	32,091	1,335,954	42 25
1856.....	30,000	1,549,500	51 65	1804.....	*28,876	1,086,323	37 62
1857.....	28,204	1,374,381	48 73	1905.....	24,655	886,081	35 94
1858.....	31,000	1,482,730	47 83	1906.....	19,516	712,334	36 50
1859.....	13,000	820,690	63 13	1907.....	17,379	663,178	38 16
1860.....	10,000	535,500	53 55	1908.....	18,039	763,520	42 33
1861.....	35,000	1,471,750	42 05	1909.....	16,217	773,788	47 71
1862.....	42,000	1,526,700	36 35	1910.....	17,665	799,002	45 23
1863.....	40,531	1,705,544	42 08	1911.....	19,109	879,205	46 01
1864.....	47,489	2,179,745	45 90	1912.....	20,600	866,024	42 04
1865.....	53,000	2,432,700	45 90	1913.....	15,661	630,042	40 23
1866.....	46,550	2,473,202	53 13	1914.....	11,373	557,846	49 05
1867.....	47,000	2,157,300	45 90	1915.....	14,199	1,157,449	81 52
1868.....	47,728	2,190,715	45 90	1916.....	21,427	2,003,425	93 50
1869.....	33,811	1,551,925	45 90	1917.....	24,382	2,396,466	98 29
1870.....	30,077	1,725,818	57 38	1918.....	22,621	2,579,472	114 03
1871.....	31,686	1,999,387	63 10	1919.....	15,200	1,353,381	89 04
1872.....	31,621	2,084,773	65 93	1920.....	10,278	775,527	75 45
1873.....	27,642	2,220,482	80 33	1921.....	3,157	140,666	44 56
1874.....	27,756	2,919,376	105 18	1922.....	3,466	191,851	55 35
1875.....	50,250	4,228,538	84 15	1923.....	5,458	332,851	60 98
1876.....	75,074	3,303,256	44 00	1924.....	7,948	543,080	68 33
1877.....	79,396	2,961,471	37 30	1925.....	7,683	621,831	80 81
1878.....	63,880	2,101,652	32 90	1926.....	5,892	516,382	87 64
1879.....	73,684	2,194,674	29 85	1927.....	6,488	714,418	111 67
1880.....	59,926	1,857,706	31 00	1928.....	<sup>b</sup> 7,107	844,649	118 84
1881.....	60,851	1,815,185	29 83	1929.....	10,152	1,195,705	117 78
1882.....	52,732	1,488,624	28 23	1930.....	11,374	1,255,257	110 36
1883.....	46,725	1,343,344	28 75	1931.....	13,478	1,121,624	83 22
1884.....	31,913	973,347	30 50	1932.....	5,349	279,780	52 30
1885.....	32,073	986,245	30 75	1933.....	4,102	229,472	55 94
1886.....	29,981	1,064,326	35 50	1934.....	7,946	534,135	67 22
1887.....	33,760	1,430,749	42 38	1935.....	9,353	628,590	67 23
1888.....	33,250	1,413,125	42 50	1936.....	8,758	671,055	76 62
1889.....	26,464	1,190,880	45 00	1937.....	9,995	837,789	83 82
1890.....	22,926	1,203,615	52 50	1938.....	12,171	846,497	69 55
1891.....	22,904	1,036,406	45 25	1939.....	11,201	1,105,563	98 43
1892.....	27,993	1,139,595	40 71	1940.....	18,907	3,209,754	169 77
1893.....	30,164	1,108,527	36 75	1941.....	25,612	4,509,041	176 03
1894.....	30,416	934,000	30 70	1942.....	30,087	5,553,357	184 58
1895.....	36,104	1,337,131	37 04	1943.....	33,948	6,177,159	181 96
1896.....	30,765	1,075,449	34 96	1944.....	28,097	3,178,969	113 14
1897.....	26,691	993,445	37 28	Totals.....	2,552,962	\$141,840,415	

<sup>a</sup> Flasks of 75 lbs. from June, 1904; of 76½ lbs. previously.

<sup>b</sup> Flasks of 76 lbs. from January, 1928.

## SILVER

*Bibliography:* State Mineralogist Reports IV, VIII, XII-XXXIX (inc.). Bulletins 67, 91, 108. Min. & Sci. Press, March 1, 1919.

The output of silver during 1944 amounted to a total of 778,936 fine ounces valued at \$553,910, being an increase in both amount and value as compared with the 1943 production, which was 609,075 fine ounces worth \$433,120. Of the 1944 yield 4,531 fine ounces worth \$3,222 came from the placers, the remainder of 774,405 fine ounces worth \$550,668 from lode or deep mines. The average price paid for new mined domestic silver in 1944 was 71.11¢ per fine ounce compared with 71.11¢ in 1943; 71.11¢ in 1942; 71.11¢ in 1941; 71.11¢ in 1940; 67.80¢ in 1939; 64.60¢ in 1938; 77.35¢ in 1937; 77.45¢ in 1936; and 71.875¢ in 1935.

Silver production by counties for 1944 was as follows:

County	Fine ounces	Value
Alpine.....	671	\$477
Amador.....	2,143	1,524
Butte.....	11,835	8,416
Calaveras.....	58,081	41,302
El Dorado.....	807	574
Fresno.....	18	13
Humboldt.....	4	3
Inyo.....	411,003	292,269
Kern.....	1,060	754
Los Angeles.....	17	12
Madera.....	180	128
Mariposa.....	115,608	82,210
Mono.....	3	2
Nevada.....	12,752	9,068
Orange.....	16,318	11,604
Placer.....	401	285
Plumas.....	24	17
Sacramento.....	1,118	795
San Bernardino.....	27,249	19,377
San Diego.....	2	1
San Joaquin and Sierra <sup>3</sup> .....	1,074	764
Shasta.....	99,765	70,944
Siskiyou.....	14,348	10,203
Stanislaus.....	180	128
Trinity.....	56	40
Tuolumne.....	2,852	2,028
Yuba.....	1,367	972
Totals.....	778,936	553,910

<sup>3</sup> Combined to conceal output of an individual.

The following paragraph is quoted from the U. S. Bureau of Mines,<sup>a</sup> chapter on Gold and Silver from Mineral Year Book 1944, by courtesy of Charles White Merrill:

"Silver—Most of the silver output in California in 1944 was more localized than that of the gold; the 10 leading silver producing mines listed in the following table yielded 82 percent of the State total recoverable silver in that year, and the 4 leading mines yielded 62 percent. All 10 leading mines derived their silver from argentiferous base-metal ores."

**Ten leading silver-producing mines in California, in 1944, in order of output**

Rank	Mine	District	County	Rank in 1943	Operator	Source of silver
1	Darwin group.....	Coso.....	Inyo.....	2	Darwin Mines (Arthur J. Theis, trustee).....	Lead ore
2	Blue Moon.....	Hunter Valley ..	Mariposa...	( <sup>1</sup> )	Red Cloud Mines, Inc.....	Zinc ore
3	Columbia No. 2.....	Resting Springs ..	Inyo.....	1	Shoshone Mines, Inc.....	Lead ore
4	Hornet.....	Flat Creek.....	Shasta.....	5	The Mountain Copper Co., Ltd.....	Copper ore
5	.....	Coso.....	Inyo.....	32	Louis Warnken, Jr.....	Lead ore
6	Pine Creek.....	Bishop Creek.....	Inyo.....	4	United States Vanadium Corp.....	Tungsten molybdenum ore
7	Penn.....	Campo Seco.....	Calaveras ..	( <sup>1</sup> )	Eagle Shawmut Mine (Penn Division).....	Zinc ore
8	Quail Hill.....	West Belt.....	Calaveras ..	7	G. Ivan Smith.....	Zinc ore
9	Silverado.....	Santa Rosa.....	Orange.....	( <sup>1</sup> )	Blue Light Silver Mines Co.....	Zinc ore
10	Last Chance.....	Coso.....	Inyo.....	6	L. D. Foreman & Co.....	Lead ore

<sup>1</sup> Not operated in 1943.

<sup>a</sup> U. S. Bureau of Mines, Mineral Year Book, 1944. (Chapter reprint), Gold, Silver, Copper, Lead, and Zinc in California, pp. 6-7.

Silver Production of California, by Years

The amount and value of the silver production of California, and the average price, annually, since 1880 are given in the table following. In the table shown in the statistical bulletins previously to Bulletin 97 (for 1925), the values shown for 1880-1904 (inc.) were taken from the reports of the Director of the Mint, of which the figures for 1880-1896 (inc.) were based on 'coinage value' (\$1.2929 per fine ounce). We have recalculated these to commercial value, using the price table of the U. S. Geological Survey (McCaskey, H. D.), Gold and Silver, 1913: Mineral Resources of the U. S., Part I, p. 847. From 1905 to date, the figures are those of the U. S. Geological Survey and its successor, the U. S. Bureau of Mines. Figures for the years prior to 1880 are not available, as there were no reliable records compiled.

Silver Production of California, by Years, Since 1880

Year	Fine oz.	Value	Average price per oz.	Year	Fine oz.	Value	Average price per oz.
1880.....	882,169	\$1,014,494	\$1 15	1913.....	1,378,399	\$832,553	\$0 604
1881.....	580,091	655,503	1 13	1914.....	1,471,859	813,938	553
1882.....	653,569	745,069	1 14	1915.....	1,678,756	851,129	507
1883.....	1,129,244	1,253,461	1 11	1916.....	2,564,354	1,687,345	658
1884.....	3,236,987	3,593,056	1 11	1917.....	1,775,431	1,462,955	824
1885.....	1,968,260	2,125,298	1 07	1918.....	1,427,711	1,427,711	1 00
1886.....	1,245,747	1,233,290	99	1919.....	1,107,189	1,240,051	1 12
1887.....	1,262,282	1,237,036	98	1920.....	1,706,327	1,859,896	1 09
1888.....	1,314,874	1,235,982	94	1921.....	3,629,223	3,629,223	1 00
1889.....	823,947	774,510	94	1922.....	3,100,065	3,109,065	1 00
1890.....	820,336	861,353	105	1923.....	3,559,443	2,918,743	82
1891.....	737,224	729,852	99	1924.....	3,555,133	2,381,952	67
1892.....	358,575	311,960	87	1925.....	3,054,416	2,119,765	694
1893.....	415,468	324,065	78	1926.....	2,022,460	1,262,015	624
1894.....	229,896	144,834	63	1927.....	1,620,242	918,677	567
1895.....	463,911	301,542	65	1928.....	1,478,711	865,081	585
1896.....	326,757	222,195	68	1929.....	1,176,895	627,285	533
1897.....	754,648	452,789	60	1930.....	1,622,803	624,779	385
1898.....	701,788	414,055	59	1931.....	867,818	251,667	290
1899.....	855,869	513,521	60	1932.....	493,533	139,176	282
1900.....	1,168,157	724,257	62	1933.....	402,591	140,907	350
1901.....	950,831	570,499	60	1934.....	844,413	545,883	644
1902.....	1,163,041	616,412	53	1935.....	1,191,112	856,112	719
1903.....	958,230	517,444	54	1936.....	2,103,799	1,629,392	775
1904.....	1,441,259	835,929	58	1937.....	2,888,265	2,234,073	774
1905.....	1,076,174	650,009	61	1938.....	2,590,804	1,674,863	646
1906.....	1,220,641	817,830	68	1939.....	2,599,139	1,764,264	678
1907.....	1,138,856	751,646	66	1940.....	2,359,776	1,678,063	711
1908.....	1,647,278	873,057	53	1941.....	2,154,188	1,531,867	711
1909.....	2,098,253	1,091,092	52	1942.....	1,450,440	1,031,424	711
1910.....	1,840,085	993,646	54	1943.....	609,075	433,120	711
1911.....	1,270,445	673,336	53	1944.....	778,936	553,910	711
1912.....	1,300,136	799,584	615				
				Totals.....	96,306,214	\$71,146,500	-----

a Average price applied to newly mined within the United States.

TIN

*Bibliography:* Reports XV, XVII, XVIII, XXV, XXXI, XXXIV, XXXV-XXXVII. Bulletins 67, 91.

During 1944 there was a small shipment of tin ore reported from Kern County which was shipped to the stock-pile of the Metal Reserve Company. The annual details were concealed under the 'Unapportioned' item so as not to reveal the output of an individual producer.

In 1940 there was some development at the Apex Mine nine miles north of Cima, San Bernardino County, but no shipments reported to date. Here the tin ore occurs in small kidneys along the talcose slip in dolomitic limestone.

In 1928 and 1929 there was a small amount of tin produced from California ore as well as considerable development work which was done at the Temeseal mine in Riverside County near Corona. There was an output from the district during 1891-1892 as tabulated below. Small quantities of stream tin have been found in some of the placer workings in northern California, but never in paying amounts.

Two occurrences have also been noted, in northern San Diego County. Crystals of cassiterite were found there, associated with blue tourmaline crystals, amblygonite and beryl. No commercial quantity has been developed, only small pockets having been taken out.

Total Output of Tin in California

Year	Pounds	Value
1891.....	125,289	\$27,564
1892.....	126,000	32,400
1928.....		
1929} <sup>a</sup> .....	1,200	580
1944.....	<sup>a</sup>	<sup>a</sup>
Totals.....	252,489	\$60,544

<sup>a</sup> Annual details concealed under 'Unapportioned.'

## TITANIUM

*Bibliography:* State Mineralogist's Reports XXIII, XXXIV.

During 1944 there were small shipments of titanium ore (ilmenite) made from material recovered from beach sand at Hermosa Beach, Los Angeles County. The annual details are concealed under the 'Unapportioned' item to conceal the output of an individual producer.

All titanium ore mined in this State came from Los Angeles County and was produced from either the beach black sands which contained approximately 20% titaniferous iron and magnetite, the gangue being silica and several silicates, or from a lode deposit in the San Gabriel Mountains.

The market price of titanium minerals varies as to the titanium oxide it contains. Present (Sept. 13, 1945) quotations are: Rutile 94% TiO at 8¢ to 10¢ a pound, ilmenite 60% TiO at \$28 to \$30 a gross ton, all prices Atlantic seaboard.

The metal is used in several different alloys with iron, copper and aluminum and for green and white paint pigments, the only colors of titanium pigments now in common use. It is also used in dyes, rubber, as a porcelain glaze, in glass, and cement made from high-titanium iron slags. This cement is resistant to the action of acids.

## Total Output of Titanium in California by Years

Year	Tons	Value
1927)*	10,013	\$150,195
1928)-----		
1929)-----		
1939)*	160	1,800
1940)-----		
1941)*	295	3,685
1942)-----		
1943)*	250	3,400
1944)-----		
Totals-----	10,718	\$159,680

\* Annual details concealed under 'Unapportioned.'

## TUNGSTEN

*Bibliography:* Reports XV, XVII, XVIII, XXII, XXIV, XXVIII (inc.), XXX, XXXIV-XXXVII (inc.). Bulletins 38, 67, 91, 95, U.S.G.S., Bull. 652. Proc. Colo. Sci. Soc., Vol. XI. South Dakota School of Mines, Bulletin No. 12. Eng. and Min. Jour.-Press, Vol. 113, pp. 666-669, Apr. 22, 1922.

The commercial production of tungsten ores and concentrates in California began in 1905; and has been continuous since, with the exception of 1920-1922, inclusive.

During 1944 shipments were made in California of high-grade tungsten ore and concentrates as reported to the Division of Mines by producers, amounting to a total of 203,965 units of  $WO_3$  or an equivalent of 3,399 net tons of 60 per cent  $WO_3$  concentrates, and valued at \$4,835,810, which came from properties in Fresno, Inyo, Kern, Madera, Mono, Nevada, Riverside, San Bernardino, and Tulare counties. The 1944 output showed a decrease in both amount and value as compared with that of 1943 which totaled 254,118 units of  $WO_3$ , or an equivalent of 4,325 tons of 60 per cent  $WO_3$  concentrates and was valued at \$5,910,745, and was the largest annual production reported in this State. The following table gives the 1943 and 1944 tungsten production by counties:

County	1943		1944	
	Units	Value	Units	Value
Fresno-----	2,888	\$79,105	8,280	\$204,624
Inyo-----	213,700	4,841,322	163,099	3,849,015
Kern-----	2,112	57,697	306	7,390
San Bernardino-----	28,172	772,226	22,594	541,823
Tulare-----	5,320	108,192	*	*
Alpine, Mariposa, Madera, Mono, Nevada*	1,926	52,203		
Madera, Mono, Nevada, Riverside, Tulare*			9,686	232,958
Totals-----	254,118	\$5,910,745	203,965	\$4,835,810

\* Combined to conceal the output of individuals in each.

The average amount received by California miners in 1944 was \$23.71 per unit  $WO_3$ , compared with \$23.26 per unit  $WO_3$  in 1943; \$24.16 per unit  $WO_3$  in 1942; \$23.77 per unit of  $WO_3$  in 1941; and \$21.15 per unit of  $WO_3$  in 1940.

Tungsten ores have been produced in California principally in the Atolia-Randsburg district in San Bernardino and Kern counties, and the Bishop district in Inyo County; with smaller amounts having come from near Posey (Jack Ranch), Tulare County; Benton, Mono County; the Kings River district in Fresno County; in eastern San Bernardino County near Goffs and Ivanpah; the Grass Valley district in Nevada County; and recently added to the above is the Darwin district in Inyo County; the Kernville and Weldon districts in Kern County; Topaz Lake district in Mono County; and near Warm Springs, San Diego County. Also there are known occurrences of tungsten ores in Alpine, Calaveras, El Dorado, Mariposa, Madera, Plumas, Riverside, Shasta, and Tuolumne counties, of which several are now in production. It also should be considered that in the last ten years there have been more new tungsten deposits discovered than any other type of mineral deposit in this State. Nearly all the ore mined in California has been scheelite (calcium tungstate), although wolframite (iron-manganese tungstate), hübnerite (manganese tungstate), and other tungsten minerals are found in small amounts, in part associated with the scheelite.

#### Total Tungsten Ore Production of California

The annual amount and value of tungsten ores and concentrates produced in California since the inception of the industry is given herewith, with tonnages recalculated to 60%  $WO_3$ :

Tungsten Production of California by Years

Year	Tons at 60% $WO_3$	Value	Average unit $WO_3$ value	Year	Tons at 60% $WO_3$	Value	Average unit $WO_3$ value
1905.....	57	\$18,800	\$5 50	1927}			
1906.....	485	189,100	6 50	1928} <sup>a</sup> .....	649	\$429,237	\$11 03
1907.....	287	120,587	7 00	1929.....	150	106,280	11 81
1908.....	105	37,750	5 99	1930}			
1909.....	577	190,500	6 50	1931} <sup>a</sup> .....	120	82,582	11 47
1910.....	457	208,245	7 60	1932.....	26	9,503	6 10
1911.....	387	127,706	5 50	1933.....	148	76,605	8 63
1912.....	572	206,000	6 00	1934.....	261	224,417	14 33
1913.....	559	234,673	7 00	1935.....	218	194,542	14 87
1914.....	420	180,575	7 17	1936.....	236	210,819	14 89
1915.....	962	1,005,467	17 42	1937.....	611	782,187	21 34
1916.....	2,270	4,571,521	33 57	1938.....	732	786,860	17 92
1917.....	2,466	3,079,013	20 81	1939.....	1,235	1,153,735	15 47
1918.....	1,982	2,832,222	24 82	1940.....	1,784	2,267,135	21 15
1919.....	214	219,316	17 08	1941.....	2,860	4,080,628	23 77
1920.....				1942.....	3,853	5,586,770	24 16
1923.....	34	19,126	8 17	1943.....	4,235	5,910,745	23 26
1924.....	781	446,009	9 52	1944.....	3,399	4,835,810	23 71
1925.....	573	348,475	10 14				
1926.....	441	316,560	11 96	Totals.....	34,146	\$41,089,402	-----

<sup>a</sup> Annual details concealed under 'Unapportioned.'

#### VANADIUM

*Bibliography:* Reports XV, XXVI. Bulletins 67, 91. Proc. Colo. Sci. Soc., Vol. XI, XXXVI. U. S. Bur. of Mines, Bulletin 104.

No commercial production of vanadium has yet been made in California. Occurrences of this metal have been found at Camp Signal, near Goffs, in San Bernardino County, and two companies at one time did considerable development work in the endeavor to open up paying quan-

tities. Some ore carrying lead vanadate has been developed in the 29 Palms, or Washington district, on the line between Riverside and San Bernardino counties, but no shipments reported.

The principal use of vanadium is as an alloy in steels, especially in tool steel, and in those varieties where resistance to repeated strains is required. Present (Sept. 13, 1945) New York quotations for ferro-vanadium are \$2.75-\$2.90 per pound of vanadium f.o.b. works, and vanadium ore 27½¢ per pound V<sub>2</sub>O<sub>5</sub> contained f.o.b. shipping point.

### ZINC

*Bibliography:* State Mineralogist Reports XIV, XV, XVII, XVIII, XX-XXIV, XXVI, XXVII, XXX, XXXIII-XXXV (inc.). Bulletins 38, 67, 91.

The recoverable zinc metal mined in California during 1944 amounted to a total of 16,456,103 pounds valued at \$1,875,996 and came from properties in eight counties. The 1944 output was an increase in both amount and value over that of 1943, which was 5,170,627 pounds worth \$558,427, and was only exceeded in value by that of 1916.

Distribution of the 1944 zinc output by counties is as follows:

County	Pounds	Value
Butte.....	2,945,519	\$335,789
Calaveras.....	2,172,165	247,627
Inyo.....	1,294,165	147,535
Kern.....	8,532	973
Mariposa.....	6,688,655	762,507
Orange.....	98,279	11,203
San Bernardino.....	235,448	26,841
Shasta.....	3,013,340	343,521
Totals.....	16,456,103	\$1,875,996

Primary zinc produced in the United States<sup>1</sup> during 1944 amounted to 893,975 short tons valued at \$157,954,000, compared with 942,309 short tons worth \$170,370,000 in 1943. Consumption of slab zinc in the United States in all industries during 1944 totaled 888,626 short tons, compared with 816,777 short tons in 1943.

The zinc ores in Shasta and Calaveras counties are associated with those of copper, while those of Inyo, Los Angeles, Orange, San Bernardino, and Tulare were associated principally with lead-silver and zinc-silver ores.

<sup>1</sup> U. S. Bureau of Mines, Mineral Market Report 1316, July 4, 1945.



## Total Zinc Production of California

Total figures for zinc output of the State are as follows, commercial production dating back only to 1906 :

Year	Pounds	Value	Year	Pounds	Value
1906.....	206,000	\$12,566	1926.....	20,447,559	\$1,533,568
1907.....	177,759	10,598	1927.....	8,625,004	552,000
1908.....	54,000	3,544	1928.....		
1909.....			1929.....		
1910.....			1931.....	149,865	5,314
1911.....	2,679,842	152,751	1932.....		
1912.....	4,331,391	298,866	1933.....	290,222	12,189
1913.....	1,157,947	64,845	1934.....	721,719	31,034
1914.....	399,641	20,381	1935.....	328,013	14,432
1915.....	13,043,411	1,617,383	1936.....	29,740	1,487
1916.....	15,950,565	2,137,375	1937.....	39,643	2,577
1917.....	11,854,804	1,209,190	1938.....	17,554	843
1918.....	5,565,516	506,466	1939.....	16,390	852
1919.....	1,384,192	101,046	1940.....	182,088	11,472
1920.....	1,188,009	96,229	1941.....	880,612	66,046
1921.....	846,184	42,309	1942.....	1,275,906	118,659
1922.....	3,034,430	172,963	1943.....	5,170,627	558,427
1923.....			1944.....	16,456,103	1,875,996
1924.....	3,060,000	198,900			
1925.....	11,546,602	877,542	Totals.....	131,111,386	\$12,307,850

## CHAPTER FOUR

### STRUCTURAL MATERIALS

*Bibliography:* State Mineralogist Reports XII-XXXVIII (inc.). Bulletin 38. Spurr and Wormser, "Marketing of Metals and Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

As indicated by this subdivision heading, the mineral substances herein considered are those more or less directly used in building and structural work. California is independent, so far as these are concerned, and almost any reasonable construction can be made with materials produced in the State. Chromite, which previous to 1933 was listed under structural materials in the statistical reports of the State Division of Mines, has been transferred to the metals group, thus coinciding with the practice of the United States Bureau of Mines.

Lime, previous to 1942, which was carried under this group, is now combined with limestone in the industrial group, so as to avoid possible duplication and because most of the lime is used in industry and not in construction. This "structural" branch of the mineral industry for 1944 had a total value of \$50,777,220, compared with \$55,055,016 in 1943. Granite, marble, miscellaneous stone, sandstone, slate, and tube-mill pebbles registered an increase in total value in 1944 over that of 1943; while all other substances in this group showed a decreased output.

In 1944 all counties but one, namely Kings, contributed to the structural materials total. There is not a county in the fifty-eight counties of the State which is not capable of producing at least one of the materials under the classification.

The following summary shows the value of the structural materials produced in California during the years 1943-1944, with increases or decreases in each instance:

Substance	1943		1944		Increase + Decrease— Value
	Amount	Value	Amount	Value	
Brick and hollow building tile.....		\$4,368,675		\$3,930,662	\$438,013—
Cement.....	18,515,085 bbls.	27,865,466	14,599,752 bbls.	21,249,520	6,615,946—
Granite.....		148,160		222,943	74,783+
Miscellaneous stone.....	32,599,456 tons	21,716,223	35,370,143 tons	25,138,003	3,421,780+
Unapportioned.....		<sup>a</sup> 956,492		<sup>b</sup> 236,092	720,400—
Total value.....		\$55,055,016		\$50,777,220	
Net decrease.....					\$4,277,796—

<sup>a</sup> Includes bituminous rock, magnesite, sandstone, slate, paving blocks, tube-mill pebbles.

<sup>b</sup> Includes bituminous rock, magnesite, marble, sandstone, slate, tube-mill pebbles.

### ASPHALT

*Bibliography:* State Mineralogist Reports VII, X, XII-XV (inc.), XVII, XVIII. Bulletins 16, 32, 63, 67, 69, 91, 118.

Asphalt was for a number of years accounted for in the statistical reports by the State Mining Bureau, because in the early days of the oil industry, considerable asphalt was produced from outcroppings of

oil sand, and was a separate industry from the production of oil itself. However, at the present time most of the asphalt comes from the oil refineries, which produce a better and more uniform grade; hence, its value is not now included in the mineral total, as to do so would be in part a duplication of the crude petroleum figures. Such natural asphalt as is at present mined is in the form of bituminous sandstones, and is recorded under that designation.

### BITUMINOUS ROCK

*Bibliography:* State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XXI, XXII, XXV, XXVI, XXXI.

This material is essentially an uncemented sandstone which is saturated with and held together by a natural asphaltic constituent, probably the residue from the evaporation of a crude petroleum deposit. Bituminous rock is still used to a limited extent for road dressing in those districts adjacent to available deposits, though the manufacture of asphalt at the oil refineries has almost entirely superseded the direct use of the native material. Some of the Santa Cruz County production is put on the market as a material which can be laid cold. This material is especially applicable and valuable for patch jobs.

During 1944 the output of bituminous rock in California came from a single property in Santa Cruz County; the annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either operator. The 1944 production showed a decrease in amount and value as compared with that of 1943.

#### Bituminous Rock Production of California, by Years

The following tabulation shows the total amount and value of bituminous rock quarried and sold in California, from the records compiled by the State Mining Bureau, annually since 1887:

Year	Tons	Value	Year	Tons	Value
1887	36,000	\$160,000	1917	5,590	\$18,580
1888	50,000	257,000	1918	2,561	9,067
1889	40,000	170,000	1919	4,614	18,537
1890	40,000	170,000	1920	5,450	27,825
1891	39,962	154,164	1921	8,298	43,192
1892	24,000	72,000	1922	4,624	13,570
1893	32,000	192,036	1923	2,945	11,780
1894	31,214	115,193	1924	6,040	14,922
1895	38,921	121,586	1925	2,681	10,724
1896	49,456	122,500	1926	3,863	21,577
1897	45,470	128,173	1927	3,515	17,704
1898	46,836	137,575	1928	4,966	38,832
1899	40,321	116,097	1929	3,320	14,360
1900	25,306	71,495	1930	8,525	36,075
1901	24,052	66,354	1931		
1902	33,490	43,411	1932	23,653	109,140
1903	21,944	53,106	1933		
1904	45,280	175,680	1934	36,793	130,301
1905	24,753	60,436	1935		
1906	16,077	45,204	1936	41,681	133,344
1907	24,122	72,835	1937		
1908	30,718	109,818	1938	36,128	139,242
1909	34,123	116,436	1939		
1910	87,547	165,711	1940	29,709	86,903
1911	75,125	117,279	1941		
1912	44,073	87,467	1942	39,798	156,193
1913	37,541	78,479	1943		
1914	66,119	166,618	1944	*	*
1915	17,789	61,468			
1916	19,449	66,561			
			Totals	1,432,988	\$4,585,162

\* Annual details concealed under 'Unapportioned.'

## BRICK AND HOLLOW TILE

*Bibliography:* State Mineralogist Reports VIII, X, XII-XV (inc.), XVII-XXVIII (inc.), XXXII, XXXVII. Bulletins 38, 39. Preliminary Report No. 7. Cal. Jour. of Development, June, 1925, pp. 5-6.

Bricks of many varieties and in important quantities are annually produced in California, as might be expected in a State with such diversified and widespread mineral resources. The varieties include common, fire, pressed, glazed, enamel, fancy, vitrified, sand-lime, and others. Not only do the plants here supply practically all of our own requirements in these products, but considerable quantities are shipped to contiguous territory and certain products are shipped over a much wider radius. We also include under this heading the various forms of hollow building 'tile' or blocks.

Brick and hollow building tile were manufactured in California during 1944 in 32 plants which reported production in 16 counties, of which there was a total of 65,546 M of common brick, valued at \$981,833; 37,754 M of fire brick 9 inch equivalent, valued at \$2,477,746; 7,276 M of glazed, pressed, vitrified, and fancy brick, valued at \$287,949; and 18,702 tons of hollow building tile, valued at \$183,134; the entire output having a total value of \$3,930,662. The 1944 production showed a decrease in amount and value of brick and building tile as compared with that of 1943, which was 70,219 M of common brick, worth \$840,921; 40,265 M of fire brick, worth \$3,174,868; 3,451 M of glazed, pressed, fancy, and vitrified brick, worth \$138,456; and 16,947 tons of hollow building tile, worth \$214,430; with a total value of \$4,368,675.

The 1944 output came from eleven plants in Los Angeles County; three in Contra Costa County; two each in Alameda, Kern, Sacramento, and San Joaquin counties; and one each in Amador, Fresno, Humboldt, Kern, Placer, Riverside, San Bernardino, San Diego, Santa Barbara, Santa Clara, and Tulare counties.

**Brick and Hollow-Tile Production of California, by Years**

Record of brick production in the State has been kept since 1893 by this Bureau, the figures for hollow building 'tile' or blocks being also included since 1914. The annual and total figures, for amount and value, are given in the following table:

Year	Brick, M	Hollow building blocks, tons	Value
1893.....	103,900		\$801,750
1894.....	81,675		457,125
1895.....	131,772		672,360
1896.....	24,000		524,740
1897.....	97,468		563,240
1898.....	100,102		571,362
1899.....	125,950		754,730
1900.....	137,191		905,210
1901.....	130,766		860,488
1902.....	169,851		1,306,215
1903.....	214,403		1,999,546
1904.....	281,750		1,994,740
1905.....	286,618		2,273,786
1906.....	277,762		2,538,848
1907.....	362,167		3,438,951
1908.....	332,872		2,506,495
1909.....	333,846		3,059,929
1910.....	340,883		2,934,731
1911.....	327,474		2,638,121
1912.....	337,233		2,940,290
1913.....	358,754		2,915,350
1914.....	270,791		2,288,227
1915.....	180,538		1,678,756
1916.....	206,960		2,096,570
1917.....	192,269	29,348	2,532,721
1918.....	136,374	34,818	2,363,481
1919.....	156,328	36,026	3,087,067
1920.....	245,842	99,208	5,704,393
1921.....	238,022	67,100	5,570,875
1922.....	374,853	105,909	7,994,991
1923.....	397,754	122,534	9,738,082
1924.....	456,716	114,469	9,137,908
1925.....	361,094	105,491	7,503,976
1926.....	388,048	90,332	7,026,124
1927.....	374,111	75,116	6,516,077
1928.....	272,443	66,277	5,694,770
1929.....	327,011	66,713	5,607,410
1930.....	267,019	68,047	4,205,460
1931.....	151,545	51,988	2,560,415
1932.....	90,683	27,098	1,605,086
1933.....	76,905	25,814	1,520,481
1934.....	66,738	17,534	1,644,661
1935.....	76,521	21,309	1,855,343
1936.....	131,667	16,081	2,240,905
1937.....	148,833	17,521	3,083,902
1938.....	129,273	16,592	2,594,546
1939.....	150,503	16,283	3,063,660
1940.....	129,887	29,048	2,762,885
1941.....	137,925	16,513	3,598,797
1942.....	180,935	24,703	5,708,967
1943.....	113,935	16,947	4,368,675
1944.....	110,576	18,702	3,930,662
Totals.....	11,398,536	1,397,521	\$166,043,880

## CEMENT

*Bibliography:* State Mineralogist Reports VIII, IX, XII, XIV, XV, XVII, XVIII, XXI-XXVIII (inc.), XXXII. Bulletin 38.

During 1944 the production of cement in California totaled 14,599,752 barrels, valued at \$21,249,520 f.o.b. plant, of which 6,509,279 barrels, worth \$9,103,749, came from six northern California mills, and 8,090,473 barrels, worth \$12,145,726, came from six southern California mills. The 1944 output was a decrease in both amount and value from that of 1943, which amounted to 18,515,085 barrels valued at \$27,865,466.

Shipments of cement during 1944 were made from thirteen mills in eleven counties to the extent of 14,947,713 barrels, valued at \$22,482,794 f.o.b. plant, as compared with 17,804,421 barrels, worth \$27,500,347 in 1943. During the year seven mills operated in northern California; one each in Calaveras, Contra Costa, Merced, San Benito, San Mateo, Santa Clara, and Santa Cruz counties, which shipped a total of 6,779,987 barrels, valued at \$10,211,086; and six mills in southern California; three in San Bernardino County and one each in Kern, Los Angeles,<sup>1</sup> and Riverside counties, which shipped a total of 8,167,726 barrels, valued at \$12,271,708.

A mill in San Bernardino County which has been idle for several years resumed production during the year, also a small shipment of cement was made from the mill in San Benito County which discontinued operation in 1943. The mill in Merced County was sold and the company is being liquidated.

The annual capacity of the California cement mills according to the U. S. Bureau of Mines <sup>2</sup> was 27,390,000 barrels as of January 1, 1945, as compared with 27,690,000 barrels for January 1, 1944. During the year an average of 2,379 men were employed in the above mills.

#### Cement Production of California, by Years

'Portland' cement was first commercially produced in California in 1891; though in 1860 and for several years following, a natural hydraulic cement from Benicia was utilized in building operations in San Francisco.

"The Benicia Cement Company in 1859-60 was turning out 50 to 100 barrels of cement a day and San Francisco was using about 12,000 barrels a year. The mill price of the product was then \$4 a barrel. By 1865, the San Francisco rate of consumption had increased to 100,000 barrels yearly, brick buildings largely taking the place of frame structures, and the price of cement had fallen to \$2.50 a barrel, about the same as it is today."<sup>3</sup>

The growth of the industry became rapid after 1902; since which time cement has continued to be an important factor in the industrial life of the State. Although the total cement figures, to date, are not of the same magnitude as those for gold and petroleum, it is interesting to note that the value of California's cement yield in the period 1920-1931 and 1942-1943 annually exceeded the value of her gold output.

<sup>1</sup> The plant in Los Angeles County grinds clinker coming from other counties, therefore the crude material is credited to the point of origin.

<sup>2</sup> U. S. Bureau of Mines, Monthly Cement Statement No. 284, Jan., 1945.

<sup>3</sup> Monthly Review of Mercantile Trust Co. of Calif., Vol. XII, No. 3, p. 55, Mar., 1924.

## Cement Production of California, by Years

Year	Barrels	Value	Year	Barrels	Value
1891	5,000	\$15,000	1919	4,645,289	\$8,591,990
1892	5,000	15,000	1920	6,709,160	14,962,945
1893			1921	7,404,221	18,072,120
1894	8,000	21,600	1922	8,962,135	16,524,056
1895	16,383	32,556	1923	10,825,405	25,999,203
1896	9,500	28,250	1924	11,655,131	23,225,850
1897	18,000	66,000	1925	13,206,630	25,043,335
1898	50,000	150,000	1926	13,797,173	25,269,678
1899	60,000	180,000	1927	14,661,783	26,474,935
1900	52,000	121,000	1928	13,625,231	24,463,287
1901	71,800	159,842	1929	12,794,729	21,038,565
1902	171,000	423,600	1930	9,831,938	14,575,731
1903	640,868	968,727	1931	7,693,712	11,510,655
1904	969,538	1,539,807	1932	5,657,549	7,967,107
1905	1,265,553	1,791,916	1933	7,284,031	10,331,395
1906	1,286,000	1,941,250	1934	8,936,085	12,445,616
1907	1,613,563	2,585,577	1935	8,086,292	10,210,721
1908	1,629,615	2,359,692	1936	13,300,188	18,314,589
1909	3,779,205	4,969,437	1937	12,072,062	16,546,229
1910	5,453,193	7,485,715	1938	10,561,037	15,502,574
1911	6,371,369	9,085,625	1939	10,984,033	15,616,219
1912	6,198,634	6,074,661	1940	13,955,255	17,673,202
1913	6,167,806	7,743,024	1941	19,531,608	26,248,694
1914	5,109,218	6,558,148	1942	23,306,578	35,808,841
1915	4,918,275	6,044,950	1943	18,515,085	27,865,466
1916	5,299,507	6,210,293	1944	14,599,752	21,249,520
1917	5,790,734	7,544,282			
1918	4,772,921	7,969,909			
			Totals	364,334,774	\$573,528,374

## GRANITE

*Bibliography:* State Mineralogist Reports X, XII-XXVI (inc.), XXVIII, XXXI, XXXV-XXXVII (inc.) Bulletin 38.

The 1944 output of granite in California had a total value of \$222,843, as compared with a total value of \$148,160 in 1943. The 1944 production was 32,909 cubic feet of monumental and building stone valued at \$215,971, the remainder being a small amount of curbing and some tuff, and volcanic rock used as building stone. The above came from two quarries each in Placer and San Diego counties, and one quarry each in Fresno, Lassen, Riverside, San Bernardino, and Sonoma counties. The material from Sonoma County was tuff.

In recent years there has been a steady decline in the production of granite and other building stone, due to the increase of concrete construction, which is steadily replacing stone.

## Varieties

For building purposes, the granite found in California, particularly the varieties from Raymond in Madera County, Rocklin in Placer County and near Porterville in Tulare County, are unexcelled by any similar stone found elsewhere. The quantities available, notably at Raymond and Porterville, are unlimited. Most of California's 'granite,' particularly that found in the Sierra Nevada Mountains, is technically 'granodiorite' (that is, both plagioclase and orthoclase feldspars are present).

Granites of excellent quality for building and ornamental purposes are also quarried in Riverside, San Bernardino, and San Diego counties. Near Lakeside, San Diego County, there is a fine-grained, 'silver gray' granite of uniform texture and color, especially suited for monumental and ornamental work.

The Fresno County stone is a dark, hornblende diorite, locally called 'black granite,' whose color permits of a fine contrast of polished and unpolished surfaces, making it particularly suitable for monumental and decorative purposes. There is also similar 'black granite' in Tulare County, near Success.

#### Granite Production of California, by Years

The value of granite produced, annually, since 1887 has been as follows:

Year	Value	Year	Value
1887.....	\$150,000	1917.....	\$221,997
1888.....	57,000	1918.....	139,861
1889.....	1,329,018	1919.....	220,743
1890.....	1,200,000	1920.....	495,732
1891.....	1,300,000	1921.....	725,901
1892.....	1,000,000	1922.....	676,643
1893.....	531,322	1923.....	760,081
1894.....	228,816	1924.....	1,211,046
1895.....	224,329	1925.....	1,853,859
1896.....	201,004	1926.....	655,332
1897.....	188,024	1927.....	1,398,443
1898.....	147,732	1928.....	763,996
1899.....	141,070	1929.....	1,169,271
1900.....	295,772	1930.....	855,477
1901.....	519,285	1931.....	636,741
1902.....	255,239	1932.....	398,676
1903.....	678,670	1933.....	183,706
1904.....	467,472	1934.....	249,083
1905.....	353,837	1935.....	339,917
1906.....	344,083	1936.....	244,243
1907.....	373,376	1937.....	207,738
1908.....	512,923	1938.....	131,386
1909.....	376,834	1939.....	145,194
1910.....	417,898	1940.....	198,896
1911.....	355,742	1941.....	261,661
1912.....	362,975	1942.....	186,872
1913.....	981,277	1943.....	148,160
1914.....	628,786	1944.....	222,843
1915.....	227,928		
1916.....	535,339	Total value.....	\$20,089,249

#### LIME

*Bibliography:* State Mineralogist Reports XIV, XV, XVII-XXIX (inc.), XXXIII-XXXV (inc.). Bulletin 38.

The early output of lime in California was used entirely for structural purposes. Later a small percent was put out for chemical, agricultural, and industrial uses and still later lime replaced limestone in metallurgy. In 1942 the structural use had decreased to such a point and other uses increased to where they required the largest part of the lime burnt in this State, so it was decided to include lime with 'industrial' limestone in this statistical report.

#### Lime Production of California, by Years

The following tabulation gives the amounts and value of lime produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. The figures for quantity have been recalculated from 'barrels,' as shown in the earlier reports, to 'tons' for the years 1894-1922 (inc.):



Year	Tons	Value	Year	Tons	Value
1894.....	37,350	\$318,700	1919.....	42,070	\$552,043
1895.....	39,776	386,094	1920.....	46,314	557,232
1896.....	30,275	261,505	1921.....	46,353	610,619
1897.....	28,780	252,900	1922.....	57,875	671,747
1898.....	29,786	254,010	1923.....	70,894	788,834
1899.....	29,985	314,575	1924.....	62,029	703,355
1900.....	31,252	283,699	1925.....	61,922	685,528
1901.....	31,738	334,688	1926.....	63,568	670,837
1902.....	44,866	369,616	1927.....	60,498	631,497
1903.....	49,659	418,280	1928.....	56,616	547,919
1904.....	57,945	571,749	1929.....	42,834	417,101
1905.....	61,700	555,322	1930.....	47,662	452,084
1906.....	68,927	763,060	1931.....	36,189	360,523
1907.....	68,422	756,376	1932.....	27,510	254,223
1908.....	39,639	379,243	1933.....	33,425	271,619
1909.....	52,075	577,824	1934.....	32,500	309,765
1910.....	47,951	477,683	1935.....	59,731	573,212
1911.....	42,959	390,988	1936.....	64,275	633,678
1912.....	52,212	464,440	1937.....	69,532	681,277
1913.....	61,344	528,547	1938.....	70,578	683,403
1914.....	43,996	378,663	1939.....	87,288	849,122
1915.....	35,653	286,304	1940.....	101,395	902,322
1916.....	49,364	390,475	1941.....	110,719	996,514
1917.....	50,073	311,380			
1918.....	43,684	461,315	Totals.....	2,481,288	\$24,291,890

## MAGNESITE

*Bibliography:* State Mineralogist Reports XII-XV (inc.), XVII-XXVII (inc.), XXX, XXXI, XXXIV, XXXVI-XXXVII. Bulletins 38, 79, 91. U. S. Geol. Surv., Bulletins 355, 540. Min. Res. 1913, Pt. II, pp. 450-453. Min. & Sci. Press, Vol. 114, p. 237. "Magnesite"—Hearings before Comm. on Ways and Means, House of Repr., on H. R. 5218, June 16, 17, and July 17, 1919. Eng. Soc. W. Penn., Proc. 1913, Vol. 29, pp. 305-388, 418-444. Eng. & Min. Jour.-Press, Vol. 114, July 29, and Dec. 2, 1922. U. S. Tariff Comm., "Crude and Caustic Calcined Magnesite. A Preliminary Statement of Information," May 19, 1926.

During 1944 magnesite was produced in California from a single property each in Santa Clara, and Stanislaus counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of a single company. Practically all the above was shipped in the calcined form.

The 1942-1943 output of magnesite in California showed a total of 198,259 net tons of crude magnesite valued at \$1,821,978, of which only a small amount was sold as such. Most of the material was calcined before being marketed. Operators reported a total of 74,099 tons calcined products valued at \$2,991,681 f.o.b. rail shipping point was made during 1942-1943, and was deadburned for refractories and in part, material for the plastic trade.

In California the known deposits are mostly in the metamorphic rocks of the Coast Ranges and the Sierra Nevada, being associated with serpentine areas. The notable exceptions are the sedimentary deposits at Bissell in Kern County and at Afton in San Bernardino County. Several thousand tons have been shipped from the Bissell deposit; and small shipments have been made from the Afton property. Beginning in 1938, a portion of the market for calcined magnesite is being supplied by magnesium oxide produced from salt-works bitterns

at a plant at Newark, Alameda County, on San Francisco Bay and in 1942 a plant started operations at Moss Landing in Monterey County using sea water and dolomite to manufacture an artificial periclase. The figures for the crude of above tonnage are included under those for magnesium salts in the Salines chapter.

#### Total Magnesite Production of California

The first commercial production of magnesite in California was made in the latter part of 1886 from the Cedar Mountain district,<sup>1</sup> southeast of Livermore, Alameda County. Shipments amounting to 'several tons' or 'several carloads' were sent by rail to New York; but there is apparently no exact record of the amount for that first year. The statistical records of the State Mining Bureau began with the year 1887, and the table herewith shows the figures for amount and value, annually, from that time. Shipments of magnesite from Napa County began in 1891 from the Snowflake Mine; from the Red Mountain deposits in Santa Clara County, in 1899; and from Tulare County in 1900.

#### Total Magnesite Production of California

Year	Tons	Value	Year	Tons	Value
1887	600	\$9,000	1917	209,648	\$1,976,227
1888	600	9,000	1918	83,974	803,492
1889	600	9,000	1919	44,696	452,098
1890	600	9,000	1920	83,695	1,033,491
1891	1,500	15,000	1921	47,837	511,102
1892	1,500	15,000	1922	55,637	594,665
1893	1,093	10,930	1923	73,963	946,643
1894	1,440	10,240	1924	67,236	900,183
1895	2,200	17,000	1925	64,623	872,944
1896	1,500	11,000	1926	50,915	587,642
1897	1,143	13,671	1927	46,093	577,887
1898	1,263	19,075	1928	45,645	501,590
1899	1,280	18,480	1929	47,269	488,014
1900	2,252	19,333	1930	38,681	388,472
1901	4,726	43,057	1931	21,576	182,283
1902	2,830	20,655	1932	*	*
1903	1,361	20,515	1933	40,303	282,325
1904	2,850	9,298	1934	*	*
1905	3,933	16,221	1935	62,509	413,228
1906	4,032	40,320	1936	*	*
1907	6,405	57,720	1937	94,491	734,443
1908	10,582	80,822	1938	*	*
1909	7,942	62,588	1939	47,954	375,005
1910	16,570	113,887	1940	*	*
1911	8,858	67,430	1941	241,620	2,069,220
1912	10,512	105,120	1942	198,259	1,821,978
1913	9,632	77,056	1943	*	*
1914	11,438	114,380	1944	*	*
1915	30,271	283,461			
1916	154,052	1,311,893	Totals	1,970,639	\$19,123,080

\* Combined under 'Unapportioned.'

#### MARBLE

*Bibliography:* State Mineralogist Reports XII-XV (inc.), XVII-XXX (inc.), XXXIV, XXXV, XXXVII. Bulletin 38. U. S. Bur. of Mines Bull. 106.

In recent years the marble output has been showing a steady decline as has that of other building stone. The presence of artificial marbles

<sup>1</sup> See U. S. Geol. Surv.; Mineral Resources of U. S., 1886, pp. 6 and 696.

and of terrazzo which are cheaper is probably the major factor for this. During 1944 in California there was a production of marble from a single property in Inyo County, the annual details are concealed under the 'Unapportioned' item so as not to reveal their output. In 1943 there was no marble reported quarried in this State. This being the first year since 1887, when the first record of the marble industry was made in this State, that there was no output.

California has many beautiful and serviceable varieties of marble, suitable for almost any conceivable purpose of construction or decoration. In the decorative class are deposits of onyx marble of beautiful coloring and effects. There is also serpentine marble suitable for electrical switchboard use.

#### Marble Production of California, by Years

Data on annual production since 1887, as compiled by the State Mining Bureau, follows. Previous to 1894 no records of amounts were preserved.

#### Total Production of Marble in California, by Years

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		\$5,000	1917	24,755	\$62,950
1888		5,000	1918	<sup>a</sup> 17,428	49,898
1889		87,030	1919	25,020	74,482
1890		80,000	1920	<sup>b</sup> 29,531	92,899
1891		100,000	1921	30,232	98,395
1892		115,000	1922	38,321	127,792
1893		40,000	1923	28,015	124,919
1894	38,441	98,326	1924	<sup>b</sup> 61,579	140,253
1895	14,864	56,566	1925	35,664	116,105
1896	7,889	32,415	1926	34,806	119,999
1897	4,102	7,280	1927	<sup>b</sup> 42,308	103,689
1898	8,050	23,594	1928	<sup>b</sup> 34,324	82,190
1899	9,682	10,550	1929	<sup>b</sup> 72,881	93,661
1900	4,103	5,891	1930	<sup>b</sup> 65,775	82,194
1901	2,945	4,630	1931	<sup>b</sup> 37,776	81,760
1902	19,305	37,616	1932	<sup>b</sup> 25,506	42,505
1903	84,624	97,354	1933	<sup>b</sup> 9,039	23,178
1904	55,401	94,208	1934	<sup>b</sup> 7,185	10,759
1905	73,303	129,450	1935	(b)	9,884
1906	31,400	75,800	1936	(b)	23,011
1907	37,512	118,066	1937	(b)	23,667
1908	18,653	47,665	1938	(a) (b)	6,015
1909	79,600	238,400	1939	(b)	14,822
1910	18,960	50,200	1940	(b)	15,189
1911	20,201	54,103	1941	(b)	14,448
1912	27,820	74,120	1942	(b)	580
1913	41,654	113,282	1943		
1914	25,436	48,832	1944	*	*
1915	22,186	41,518			
1916	25,954	50,280	Total value		\$3,568,420

<sup>a</sup> Includes onyx and serpentine.

<sup>b</sup> Includes onyx and travertine.

#### ONYX AND TRAVERTINE

*Bibliography:* State Mineralogist Reports XII-XV (inc.), XVII, XVIII, XXI, XXIII, XXXI, XXXIV. Bulletin 38.

Onyx and travertine are known to exist in a number of places in California, but there has been only a small and irregular production since the year 1896. During 1944 no onyx or travertine was reported shipped. In 1942 there was one producer of travertine in Solano County, the figures of which are combined with marble. This material is used in terrazzo and for ornamental purposes.

Onyx Production of California, by Years

Production by years has been as follows :

Year	Value	Year	Value
1887	*	1926	\$7,575
1888	\$900	1927	*
1889	900	1928	*
1890	900	1929	*
1891	1,500	1930	*
1892	2,400	1931	*
1893	1,800	1932	*
1894	27,000	1933	*
1895	20,000	1934	*
1896	12,000	1935	*
1918	24,000	1936	*
1919	*	1937	*
1920		1938	*
1921	1,294	1939	*
1922	3,320	1940	*
1923	2,510	1941	*
1924	*	1942	*
1925	16,120	1943	
		Total value	\$122,219

\* See under Marble.

SANDSTONE

*Bibliography:* State Mineralogist Reports XII-XV, XVII, XVIII, XXI, XXIII, XXVI-XXVIII (inc.), XXXIV, XXXV. Bulletin 38. U. S. Bur. of Mines, Bull. 124.

An unlimited amount of high-grade sandstone is available in California, but the wide use of concrete in buildings of every character, as well as the popularity of a lighter-colored building stone, has curtailed production in this branch of the mineral industry during recent years almost to the vanishing point. During 1944 sandstone as reported in California came from two quarries in Monterey County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either producer. The 1943-1944 output totaled 1,124 cubic yards of sandstone valued at \$7,415 at the quarry.

Practically all of the material was flagstone which is used in garden walks, fountains, walls and fireplaces to give effect to Spanish and English types of homes. The material reported from Monterey and San Luis Obispo counties is in reality an indurated shale of the Monterey series, of a cream color and utilized as a building stone.

Sandstone Production of California, by Years

Amount and value, so far as contained in the records of this Bureau, are presented herewith, with total value from 1887 to date :

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		\$175,000	1917	31,090	\$7,074
1888		150,000	1918	900	400
1889		175,598	1919	5,400	3,720
1890		100,000	1920	10,500	2,300
1891		100,000	1921	10,150	2,112
1892		50,000	1922	900	1,100
1893		26,314	1923	7,000	13,000
1894		113,592	1924	6,700	3,600
1895		35,373	1925	14,704	14,362
1896		28,379	1926	34,100	17,500
1897		24,086	1927	222,900	205,400
1898		46,384	1928	134,100	43,250
1899	56,264	103,384	1929	177,655	49,881
1900	378,468	254,140	1930	160,704	56,404
1901	266,741	192,132	1931	110,244	30,960
1902	212,123	142,506	1932	41,793	13,286
1903	353,002	585,309	1933	25,980	10,888
1904	363,487	567,181	1934	21,738	14,245
1905	302,813	483,268	1935	38,426	9,268
1906	182,076	164,068	1936	24,705	9,180
1907	159,573	148,148	1937	73,190	15,680
1908	93,301	55,151	1938	43,107	9,384
1909	79,240	37,032	1939	54,380	12,494
1910	165,971	80,443	1940	27,992	13,083
1911	255,313	127,314	1941	60,958	13,143
1912	66,487	22,574	1942	20,427	8,587
1913	62,227	27,870	1943*		
1914	111,691	45,322	1944*	30,672	7,415
1915	63,350	8,438			
1916	17,270	10,271			
			Total value		\$4,666,893

\* Under 'Unapportioned.'

## SERPENTINE

### *Bibliography:* State Mineralogist Report XV. Bulletin 38.

Serpentine has not been produced in California to a very large extent at any time. A single deposit, that on Santa Catalina Island, has yielded the principal output to date. Some material was shipped from there in 1917 and 1918, being the only output recorded since 1907. It was used for decorative building purposes and for electrical switchboards. As there was but a single operator, the figures were combined with those of marble output for those years.

The production of serpentine prior to 1919 was 'verde antique' which is used as an ornamental stone and often classed as a marble. In recent years experimental tests have proved several possible commercial applications to which this mineral might be put such as an admix in cement, in the manufacture of magnesium chemicals, in terrazzo, as a substitute for soapstone, and as a filler. During 1938 there was a small shipment of serpentine from one property in San Bernardino County. The annual details are concealed in the 'Unapportioned' item so as not to reveal the output of an individual.

### Serpentine Production of California, by Years

The following table shows the amount and value of serpentine from 1895 as recorded by this bureau:

## Serpentine Production in California, by Years

Year	Cubic feet	Value	Year	Cubic feet	Value
1895.....	4,000	\$4,000	1905.....		
1896.....	1,500	6,000	1906.....	847	\$1,694
1897.....	2,500	2,500	1907.....	1,000	3,000
1898.....	750	3,000	1917.....	<sup>a</sup>	<sup>a</sup>
1899.....	500	2,000	1918.....	<sup>b</sup>	<sup>b</sup>
1900.....	350	2,000	1919.....		
1901.....	89	890	1938.....	<sup>b</sup>	<sup>b</sup>
1902.....	512	5,065			
1903.....	99	800			
1904.....	200	2,310	Totals.....	12,347	\$33,259

<sup>a</sup> Under 'Unapportioned.'<sup>b</sup> See under Marble.

## SLATE

*Bibliography:* State Mineralogist Reports XV, XVIII, XXIV, XXVIII, XXXIV. Bulletin 38. U. S. Geol. Surv., Bull. 586. U. S. Bur. of Mines, Bull. 218.

Slate was first produced in California in 1889. Up to and including 1910 such production was continuous, but since then it has been irregular. Large deposits of excellent quality are known in the State, especially in El Dorado, Calaveras and Mariposa counties, but the demand has been light owing principally to competition of cheaper roofing materials.

As the 1944 slate output in California came from a single property in El Dorado County, the annual details are concealed under the 'Unapportioned' item so as not to reveal the production of an individual. The 1944 production showed an increase in both amount and value over that of 1943. The 1943-1944 output totaled 17,309 net tons valued at \$102,851.

## Total Production of Slate in California

A complete record of amount and value of slate produced in California follows:

Year	Squares	Value	Year	Squares	Value
1889.....	4,500	\$18,089	1920.....	8	\$80
1890.....	4,000	24,000	1921.....		
1891.....	4,000	24,000	1922.....	200	2,400
1892.....	3,500	21,000	1923.....		
1893.....	3,000	21,000	1926.....	( <sup>a</sup> )	7,371
1894.....	1,800	11,700	1927.....	<sup>b</sup> 2,686	17,960
1895.....	1,350	9,450	1928.....	<sup>b</sup> 4,075	31,263
1896.....	500	2,500	1929.....		
1897.....	400	2,800	1930/*.....	<sup>b</sup> 8,220	71,347
1898.....	400	2,800	1931.....		
1899.....	810	5,900	1932/*.....	<sup>b</sup> 8,234	55,182
1900.....	3,500	26,250	1933.....	<sup>b</sup> 5,343	31,958
1901.....	5,100	38,250	1934.....	<sup>b</sup> 5,065	24,245
1902.....	4,000	30,000	1935.....	( <sup>a</sup> )	40,912
1903.....	10,000	70,000	1936.....	( <sup>a</sup> )	49,818
1904.....	6,000	50,000	1937.....	( <sup>a</sup> )	32,572
1905.....	4,000	40,000	1938.....	<sup>b</sup> 6,871	30,281
1906.....	10,000	100,000	1939.....	<sup>b</sup> 5,777	28,327
1907.....	7,000	60,000	1940.....	<sup>b</sup> 4,777	18,031
1908.....	6,000	60,000	1941.....		
1909.....	6,961	45,660	1942/*.....	<sup>b</sup> 16,596	80,321
1910.....	1,000	8,000	1943/*.....	<sup>b</sup> 17,309	102,851
1911.....			1944.....		
1915.....	1,000	5,000			
1916.....			Total value.....		\$1,306,318

\* Annual details concealed under 'Unapportioned.'

<sup>a</sup> Quantity not shown as both 'squares' and 'tons' included.<sup>b</sup> Tons.

## MISCELLANEOUS STONE

*Bibliography:* State Mineralogist Reports XII-XXVIII (inc.), XXXI-XXXII, XXXV-XXXVII. Bulletin 38; also annual statistical bulletins from 1915 to date.

'Miscellaneous stone' is the name used throughout this report as the title for that branch of the mineral industry covering crushed rock of all kinds, paving blocks, sand and gravel, and pebbles for grinding mills. The foregoing are very closely related from the standpoint of the producer; therefore it has been found to be most satisfactory to group these items as has been done in recent reports of this Bureau. So far as it has been possible to do so, crushed rock production has been subdivided into the various uses to which the product was put. It will be noted, however, a very large percentage of the output has been tabulated under the heading 'Unclassified.' This is necessary because of the fact that many of the producers have no way of telling to what specific use their rock was put (or at least the proportions to each use) after they have quarried and sold the same to distributors and contractors.

In addition to amounts produced by commercial firms, both corporations and individuals, there is hardly a county in the State but uses more or less gravel and broken rocks on its roads. Of much of this, particularly in the country districts, there is no definite record kept.

As reported to the Division of Mines by producers during 1944, there was a total of 35,370,143 net tons of miscellaneous stone, including sand, gravel, crushed rock, rubble and riprap produced in California, valued at \$25,138,003, as compared with 32,599,456 tons, worth \$21,716,223 in 1943. Alameda County led all counties in 1944 as to value of miscellaneous stone with an output worth \$6,112,065. Los Angeles County was second with an output worth \$4,596,097, San Diego County third with an output worth \$1,629,510, followed in turn by Riverside and Sacramento counties each with a production worth over a million dollars. Under this heading every county in the State contributed in 1944 with the exception of Kings County.

### Paving Blocks

During 1944 there was no production of paving blocks reported in California. The 1943 output of paving blocks came from a single quarry in Sacramento County. The annual details are concealed under the 'Unapportioned' item so as not to reveal production of either operator.

The paving block industry has decreased materially of recent years, practically to the vanishing point, because of the increased construction of smoother pavements demanded by motor vehicle traffic. The blocks made in Solano County were of Basalt; those from Sonoma were of basalt, andesite, and some trachyte, while those from Madera, Placer, Riverside, San Bernardino, and San Diego were of granite; and those from San Mateo County were of a sandstone.

The amount and value of paving block production, annually, since 1887 has been as follows:

Year	Amount M	Value	Year	Amount M	Value
1887	*10,000	\$350,000	1916	1,322	\$54,362
1888	10,500	367,500	1917	938	38,567
1889	7,303	297,236	1918	372	17,000
1890	7,000	245,000	1919	27	1,350
1891	5,000	150,000	1920	63	3,155
1892	*3,000	96,000	1921	4	280
1893	2,770	96,950	1922	72	3,924
1894	2,517	66,981	1923	15	880
1895	2,332	73,338	1924	11	935
1896	4,161	77,584	1925	27	1,350
1897	1,711	35,235	1926		
1898	1,144	21,725	1927	41	2,057
1899	305	7,861	1928	25	1,658
1900	1,192	23,775	1929		
1901	1,920	41,075	1930		
1902	3,502	112,437	1931/ a	66	5,900
1903	4,854	134,642	1932		
1904	3,977	161,752	1934	2	75
1905	3,408	134,347	1935		
1906	4,203	173,432	1938		
1907	4,604	199,347	1939/ a	9	439
1908	7,660	334,780	1940		
1909	4,503	199,803	1941/ a	155	30,862
1910	4,434	198,916	1942		
1911	4,141	210,819	1943/ a	5	201
1912	11,018	578,355	1944		
1913	6,364	363,505			
1914	6,053	270,598	Totals	136,009	\$5,357,134
1915	3,285	171,092			

\* Figures for 1887-1892 (inclusive) are for Sonoma County only, as none are available for other counties during that period though Solano County quarries were then also quite active.

a Annual details concealed under 'Unapportioned.'

### Grinding-Mill Pebbles

The 1944 output of grinding-mill pebbles in California came from a single property in San Diego County. The annual details are combined under the 'Unapportioned' item so as not to reveal the output of an individual. The 1944 production was an increase in amount and value as compared with that of 1943 which came from two properties in San Diego County and one in Calaveras County.

The amount and value of grinding-mill pebbles, annually, follows:

Year	Tons	Value	Year	Tons	Value
1915	340	\$2,810	1931		
1916	20,232	107,567	1932/ *	25	\$211
1917	21,450	90,538	1933		
1918	8,628	61,268	1934/ *	300	3,018
1919	2,607	19,272	1935		
1920	2,104	17,988	1936/ *	961	8,356
1921	247	1,418	1937		
1922	1,571	7,628	1938/ *	960	4,800
1923	2,650	14,936	1939		
1924	434	2,969	1940/ *	482	982
1925	215	1,385	1941		
1926	102	612	1942/ *	573	2,650
1927	288	1,800	1943		
1928	372	2,408	1944/ *	162	1,367
1929					
1930/ *	166	1,225	Totals	64,869	\$285,208

\* Annual details concealed under 'Unapportioned.'



## Sand and Gravel

A considerable part of the gravel excavated is passed through grading and washing plants, and the material over 2 inches in size is crushed. Much of it is utilized in concrete mixtures. Most of the gravel used for road surfacing and repairs as well as that for railroad ballast is creek-run or pit-run material which is spread upon the roads without undergoing any grading or washing.

The 1944 sand and gravel output totaled 21,318.163 tons, valued at \$13,217,071, as compared with 21,672,727 tons, worth \$13,726,756 in 1943.

Included in the above is a total of 97,444 net tons of molding sand, valued at \$306,412 which came from a single property each in Contra Costa, Monterey, Orange, Riverside, Sacramento, San Diego, San Mateo, Santa Barbara, and Ventura counties. The 1944 output showed an increase in amount with a decreased value as compared with that of 1943, which was 80,297 tons worth \$316,577.

The distribution of the 1944 output of sand and gravel by counties is as follows:

County	Tons	Value
Alameda.....	3,231,372	\$2,224,850
Butte.....	59,749	28,593
Calaveras.....	26,955	26,714
Contra Costa.....	<sup>a</sup> 400,640	290,576
Del Norte.....	22,410	17,748
El Dorado.....	5,150	3,900
Fresno.....	347,894	294,323
Glenn.....	86,950	30,512
Humboldt.....	160,503	128,638
Imperial.....	115,384	89,690
Inyo.....	23,123	10,712
Kern.....	415,291	218,106
Lake.....	58,191	30,735
Lassen.....	12,394	6,961
Los Angeles.....	5,836,089	2,829,989
Mendocino.....	47,498	49,601
Merced.....	128,163	67,602
Modoc.....	415,306	87,274
Mono.....	6,448	4,669
Monterey.....	<sup>a</sup> 452,740	414,595
Nevada.....	10,725	15,900
Orange.....	<sup>a</sup> 1,169,540	737,613
Placer.....	7,816	4,794
Plumas.....	40,027	16,765
Riverside.....	<sup>a, b, c</sup> 332,191	211,358
Sacramento.....	<sup>a</sup> 1,221,694	870,460
San Bernardino.....	1,240,832	811,507
San Diego.....	<sup>a, b, c</sup> 1,725,961	1,519,305
San Joaquin.....	364,917	230,028
San Luis Obispo.....	84,669	40,043
San Mateo.....	<sup>a</sup> 26,862	36,591
Santa Barbara.....	<sup>a</sup> 174,334	159,254
Santa Clara.....	300,789	180,906
Shasta.....	550,450	232,600
Sierra.....	10,900	9,900
Siskiyou.....	18,260	16,811
Stanislaus.....	124,678	94,394
Sutter.....	9,204	2,761
Tehama.....	27,063	30,919
Trinity.....	9,126	11,599
Tulare.....	193,497	98,845
Ventura.....	<sup>a</sup> 435,214	161,114
Yolo.....	86,899	28,706
Yuba.....	150,574	98,884
Alpine, Amador, Colusa, Madera, Marin, Mariposa, Napa, San Benito, Santa Cruz, Solano, Sonoma, Tuolumne*	1,149,691	740,226
<b>Totals.....</b>	<b>21,318,163</b>	<b>\$13,217,071</b>

\* Combined to conceal output of producers in each.

<sup>a</sup> Includes molding sand.

<sup>b</sup> Includes filter sand.

<sup>c</sup> Includes blast sand.

### Crushed Rock

To list the kinds and varieties of rock utilized commercially under this heading would be to run almost the entire gamut of the classification scale. Much depends on the kind available in a given district. Those which give the most satisfactory service are the basalts and other hard, dense, igneous rocks which break with sharp, clean edges. In many localities, river-wash boulders form an important source of such material. In such cases, combined crushing and washing plants obtain varying amounts of sand and gravel along with the crushed sizes. In Sacramento and Butte counties the tailings piles from the gold dredgers are the basis of like operations.

The values given are based on the selling price, f.o.b. cars, barges, or trucks, at the quarry. The 1944 output amounted to 14,051,980 tons, valued at \$11,920,932, as compared with 10,926,729 tons, worth \$7,989,467 in 1943. The accompanying table gives the breakdown of crushed rock by counties for 1944.



Quarry and Plant of Granite Rock Company, Logan Siding, San Benito County  
Photo by Walter W. Bradley

### Miscellaneous Stone Production of California, by Years

The amount and value, annually, of crushed rock (including macadam, ballast, rubble, riprap, and that for concrete), and sand and gravel, since 1893, follow:

	Macadam and ballast		Rubble and Riprap		For concrete		Unclassified		Totals	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Alameda.....	1,534,864	\$1,486,491	255,000	\$508,000	*	*	a, 42,797,645	\$1,784,490	4,587,509	\$2,778,981
Amador.....	1,460	487			*	*	*	*	1,460	487
Butte.....	47,698	50,607			*	*	*	*	47,698	50,607
Calaveras.....	a, 69,431	57,066			3,095	5,015			72,526	62,081
Fresno.....	a, 163,886	84,766	*	*			49,204	52,075	215,090	136,831
Humboldt.....							13,670	23,500	13,670	23,500
Kern.....	a, 5,800	2,000	1,200	2,500					7,000	4,500
Lassen.....							18,766	17,984	18,766	17,984
Los Angeles.....	a, 218,568	99,863	838,500	802,800	71,260	31,480	a, 41,575,302	831,965	2,703,630	1,766,108
Mendocino.....	17,400	19,100	*	*	*	*			17,400	19,100
Merced.....							103,640	115,677	103,640	115,677
Modoc.....	c, 67,469	126,783			*	*	a, 5,018	2,534	72,487	128,317
Nevada.....	2,777	3,471	*	*					8,550	14,250
Placer.....	a, 33,890	13,436	*	*	*	*			2,777	3,471
Riverside.....									33,890	15,436
Sacramento.....	4,280	4,280	9,263	13,103			500,868	372,467	500,868	372,467
San Bernardino.....	*	*	18,950	20,335	27,668	26,318	99,404	69,702	140,615	113,403
San Diego.....	37,146	25,288			52,056	47,660	*	*	71,006	68,055
San Mateo.....	2,822	2,921			*	*	*	*	37,146	25,288
Santa Barbara.....	*	*					*	*	2,822	2,921
Santa Clara.....	c, 252,740	68,658	144,399	72,199			*	*	144,399	72,199
Siskiyou.....					8,200	8,400	*	*	260,940	77,058
Tehama.....							17,207	25,800	17,207	25,800
Trinity.....	*	*	15,800	26,900	*	*	1,874	1,742	1,874	1,742
Ventura.....	19,215	24,018							15,800	26,900
Yolo.....									19,215	24,018
Contra Costa, El Dorado, Inyo, Marin, Napa, Sacramento, San Benito, San Diego, Santa Clara, Shasta, Sonoma, Stanislaus, Tulare, Tuolumne, Ventura, Yuba*	1,810,111	1,520,174							1,810,111	1,520,174
Contra Costa, El Dorado, Humboldt, Marin, Merced, Napa, Placer, Riverside, Sacramento, San Francisco, Solano, Sonoma, Yuba*			984,511	1,239,164					984,511	1,399,164
Amador, Butte, Contra Costa, El Dorado, Merced, Modoc, Napa, Riverside, San Mateo, Sonoma, Stanislaus, Ventura, Yuba*					397,541	390,701			397,541	390,701
Amador, Butte, Contra Costa, Inyo, Marin, Mono, Orange, dRiverside, aSan Diego, San Francisco, San Joaquin, Santa Barbara, Santa Clara, Shasta, Siskiyou, Solano, Sonoma, Tulare, Tuolumne, Yuba*										
Totals.....	4,300,107	\$3,604,749	2,267,623	\$2,845,061	559,820	\$509,574	6,924,430	\$4,961,548	14,051,980	\$11,920,932

\* Combined to conceal the output of operators in each.

a Includes decomposed granite.

b Includes slag.

c Includes volcanic cinders.

d Includes granules for roofing and terrazzo.



Quarry Face of Granite Rock Company, Logan Siding, San Benito County  
Photo by Walter W. Bradley

Crushed Rock, Sand and Gravel, by Years

Year	Tons	Value	Year	Tons	Value
1893.....	371,000	\$456,075	1920.....	9,792,122	\$6,782,414
1894.....	661,900	664,838	1921.....	10,914,145	7,834,640
1895.....	1,254,688	1,095,939	1922.....	13,049,644	10,366,231
1896.....	960,619	839,884	1923.....	19,840,301	15,379,838
1897.....	821,123	600,112	1924.....	21,451,129	15,962,476
1898.....	1,177,365	814,477	1925.....	23,819,137	17,407,113
1899.....	964,898	786,892	1926.....	24,987,606	19,859,261
1900.....	789,287	561,642	1927.....	25,126,691	18,912,994
1901.....	530,396	641,037	1928.....	27,471,794	17,328,044
1902.....	2,056,015	1,249,529	1929.....	27,104,618	17,840,159
1903.....	2,215,625	1,673,591	1930.....	23,514,168	16,430,027
1904.....	2,296,898	1,641,877	1931.....	15,848,313	11,848,531
1905.....	2,624,257	1,716,770	1932.....	11,361,564	7,183,643
1906.....	1,555,372	1,418,406	1933.....	11,181,156	6,871,581
1907.....	2,288,888	1,915,015	1934.....	16,148,275	7,131,330
1908.....	3,998,945	3,241,774	1935.....	9,041,876	5,571,041
1909.....	5,531,561	2,708,326	1936.....	28,528,079	16,578,238
1910.....	5,827,828	2,777,690	1937.....	28,254,740	16,917,683
1911.....	6,487,223	3,610,357	1938.....	19,051,677	11,734,038
1912.....	8,044,937	4,532,598	1939.....	18,693,896	10,316,787
1913.....	9,817,616	4,823,056	1940.....	24,184,186	12,181,564
1914.....	9,288,397	3,960,973	1941.....	34,626,035	19,559,883
1915.....	10,879,497	4,609,278	1942.....	45,455,085	27,281,342
1916.....	9,951,089	4,009,590	1943.....	32,599,432	21,716,223
1917.....	8,069,271	3,505,662	1944.....	35,370,143	25,138,003
1918.....	6,641,144	3,325,889			
1919.....	6,919,188	3,678,322			
			Totals.....	649,440,863	\$424,992,683

A comparison of the above table of annual production of these materials with the similar table for cement (see *ante*) reveals the fact that the important growth of the crushed rock and gravel business was coincident with the rapid development of the cement industry from the year 1902.

## CHAPTER FIVE

### INDUSTRIAL MATERIALS

*Bibliography:* State Mineralogist Reports XII-XXXVII (inc.). Bulletin 38. Min. & Sci. Press, Vol. 114, March 10, 1917. Spurr and Wormser, "Marketing of Metals and Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

The following mineral substances have been arbitrarily arranged under the general heading of 'Industrial Materials,' as distinguished from those which have clearly a defined classification, such as metals, salines, structural materials, etc.

These materials, many of which are mineral earths, are, with four or five exceptions, as yet produced on a comparatively small scale. The possibilities of development along several of these lines are large, and with increasing transportation and other facilities, together with steadily growing demands, the future for this branch of the mineral industry in California is promising. There is scarcely a county in the State but might contribute to the output.

Up to within the last few years, at least, production has been in the majority of instances dependent upon more or less of a strictly local market, and the annual tables show the results of such a condition, not only in the widely varying amounts of a certain material produced from year to year, but in widely varying prices of the same material.

The more important of these minerals thus far exploited, so far as shown by value of the output, are barytes, bentonite (fuller's earth), pottery clay, diatomite, dolomite, gypsum, limestone, mineral water, pumice and volcanic ash, pyrite, silica, and soapstone and talc.

In 1937 the mineral zircon was added to this group. The material mined was used as an abrasive and a refractory.

This group as a whole showed an increase in total value from \$10,656,288 in 1943 to \$11,515,327 in 1944, with all principal mineral substances showing an increased output but diatomite and mineral water.

The following table gives the comparative figures for the amounts and value of industrial minerals produced in California during the years 1943 and 1944.

Substance	1943		1944		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Bentonite.....	11,480 tons	\$118,257	25,581 tons	\$180,065	\$61,808+
Carbon dioxide.....	227,424 Mcu. ft.	248,126	*	*	-----+
Clay (pottery).....	622,019 tons	1,185,240	491,363 tons	1,241,652	56,412+
Dolomite.....	331,251 tons	472,756	217,018 tons	619,425	146,669+
Gem material.....		329,868	*	*	-----
Gypsum.....	495,967 tons	916,883	558,488 tons	949,833	32,950+
Limestone.....	495,262 tons	1,378,647	734,425 tons	1,714,414	335,767+
Mineral water.....	22,022,314 gals.	814,700	24,445,814 gals.	\$12,645	2,055—
Pumice and volcanic ash.....	21,154 tons	142,665	34,525 tons	272,064	129,399+
Silica (quartz and glass sand).....	161,318 tons	533,434	274,291 tons	\$30,311	296,877+
Soapstone and talc.....	63,012 tons	723,056	64,041 tons	\$24,052	100,996+
Unapportioned.....		*3,792,656	-----	*4,070,866	278,210+
Total value.....		\$10,656,288		\$11,515,327	-----
Net increase.....					\$859,039

\* Included under 'Unapportioned.'

<sup>a</sup> Includes asbestos, barite, diatomite, feldspar, lithia minerals, mineral paint, pyrite, sillimanite andalusite kyanite group, strontium minerals.

<sup>b</sup> Includes asbestos, barite, carbon dioxide, diatomite, feldspar, fluorspar, gems, lithia, mica, mineral paint, pyrite, sillimanite group, strontium.

## ASBESTOS

*Bibliography:* State Mineralogist Reports XII-XIX (inc.), XXII, XXVII (inc.), XXIX, XXXI-XXXII, XXXIV-XXXVII (inc.). Bulletins 38, 91. Canadian Dept. of M., Mines Branch Bulletin 69. Min. and Sci. Press, April 10, 1920, pp. 531-533. Eng. & Min. Jour.-Press, Vol. 113, pp. 617-625, 670-677. Asbestology, Vol. 5, No. 7, July, 1927.

During 1944 there was a production of asbestos in California coming from a single property each in Napa, Placer, and Shasta counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either producer. In addition to the two producing properties there was a property each in Placer and San Benito counties under development in preparation for future production. The 1944 output was a decrease in amount and value as compared with that of 1943. The total of the 1943-1944 output was 723 net tons valued at \$15,000.

Of the 1943 and 1944 production, that coming from Napa County was the chrysotile variety and that from Placer and Shasta counties was tremolite asbestos.

There are two varieties of asbestos, amphibole and serpentine. The most valuable and widely used is the serpentine or chrysotile variety. Chrysotile asbestos has short strong fibers varying in length from  $\frac{1}{8}$  of an inch to three inches but mostly less than one inch. The value of the material varies greatly as to the length of the fiber; the longer demanding a premium. It is used as insulation for heat and electricity, in brake linings, steam packing, pipe coverings, in paint, waterproof paper roofing, cement, stucco, and plasters, in heat resisting textiles, as gloves, curtains, cord, etc.

The amphibole variety may be any one of several minerals of the amphibole group. The fibers of this type are weak and often brittle, and they are much more abundant but their uses are limited and value small, being restricted to heat insulation, chemical filters, and sometimes as a filler.

**Asbestos Production of California, by Years**

Total amount and value of asbestos production in California since 1887, as given in the records of this Bureau, are as follows:

Year	Tons	Value	Year	Tons	Value
1887	30	\$1,800	1915	143	\$2,860
1888	30	1,800	1916	145	2,380
1889	30	1,800	1917	136	10,225
1890	71	4,260	1918	229	9,903
1891	66	3,960	1919		
1892	30	1,830	1920	131	6,240
1893	50	2,500	1921	410	19,275
1894	50	2,250	1922	50	1,800
1895	25	1,000	1923	20	200
1896			1924	70	4,750
1897			1925		
1898	10	200	1926	25	1,650
1899	30	750	1927		
1900	50	1,250	1928	13	1,160
1901	110	4,400	1929		
1902			1930	219	6,175
1903			1931		
1904	10	162	1932		
1905	112	2,625	1933	309	3,274
1906	70	3,500	1935		
1907	70	3,500	1936		
1908	70	6,100	1941	16	2,867
1909	65	6,500	1942	4	836
1910	200	20,000	1943	723	15,000
1911	125	500	1944		
1912	90	2,700			
1913	47	1,175	Totals	4,135	\$164,687
1914	51	1,530			

\* Annual details concealed under 'Unapportioned.'

### BARITE

*Bibliography:* State Mineralogist Reports XXII, XIV, XV, XVII, XXI-XXVIII (inc.), XXXIV-XXXV (inc.), XXXVII. Bulletins 38, 87. Eng. & Min. Jour.-Press, Vol. 114, p. 109, July 15, 1922; Vol. 115, pp. 319-324, Feb. 17, 1923. U. S. Bureau of Mines, inform. Circ. 6221, 6223.

During 1944 the barite (including some witherite) produced in California came from two properties, one each in Mariposa and Nevada counties, the annual details being concealed in the 'Unapportioned' items so as not to reveal the output of either operator. This material was consumed in the manufacture of lithopone, a heavy-gravity oil-well drilling-mud, fillers, and barium chemicals.

The 1944 output showed an increase in amount and value as compared with that of 1943. Commercial production of barite for the years 1942 and 1943 totaled 53,625 net tons valued at \$311,910.

Barite's largest use in the United States is in the manufacture of lithopone, which is a chemically-prepared white pigment containing approximately 70% barium sulphate and 30% zinc sulphide. This is one of the principal constituents of 'flat' wall paints. Other important uses for barite, after washing and grinding, are as an inert pigment and filler in paint, paper, linoleums, oilcloth and rubber manufacture, and in the preparation of a number of chemicals including barium binocide, carbonate, chloride, nitrate, the sulphate precipitated, or 'blanc fixe,' and in medicine.

Present (Aug. 10, 1944) quotations for barite (95% BaSO<sub>4</sub>) vary from \$8.50 to \$9.00 per ton, crude, f.o.b. rail shipping point. Most barite has to be washed and acid treated to remove iron stains or other impurities before being suitable for paint use.

Known occurrences of this mineral in California are located in Inyo, Los Angeles, Mariposa, Monterey, Nevada, San Bernardino, Shasta,



Santa Barbara and Tulare counties. The deposit at El Portal, in Mariposa County, has given the largest commercial production to date, in part witherite (barium carbonate,  $\text{BaCO}_3$ ). Witherite has also been found in Shasta County, but no shipments have yet been made from the deposit. The carbonate is especially desirable, as it is a simpler and hence a cheaper source for preparation of barium chemicals, notably the nitrate which is used in priming mixture for incendiary bombs.

#### Total Barite Production of California

The first recorded production of barite in California, according to the statistical reports of the State Mining Bureau, was in 1910. The annual figures are as follows:

Year	Tons	Value	Year	Tons	Value
1910.....	860	\$5,640	1928.....	13,406	\$55,888
1911.....	309	2,207	1929.....	26,796	168,829
1912.....	564	2,812	1930.....	19,783	133,107
1913.....	1,600	3,680	1931.....	27,832	156,647
1914.....	2,000	3,000	1932.....	8,507	49,409
1915.....	410	620	1933.....	8,405	49,595
1916.....	1,606	5,516	1934.....	21,769	125,514
1917.....	4,420	25,633	1935.....	22,979	133,810
1918.....	100	1,500	1936.....		
1919.....	1,501	18,065	1937*.....	41,882	245,392
1920.....	3,029	20,795	1938*.....		
1921.....	901	4,809	1939*.....	66,228	396,218
1922.....	3,370	18,925	1940.....		
1923.....	2,925	16,058	1941*.....	57,728	377,229
1924.....			1942.....		
1925.....			1943*.....	53,625	311,910
1926.....	4,798	38,165	1944.....	*	*
1927.....	17,993	90,617			
			Totals.....	415,506	\$2,461,600

\* Annual details concealed under 'Unapportioned.'

#### BENTONITE (Fuller's Earth)

*Bibliography:* State Mineralogist Reports XIV, XVII, XVIII, XXI, XXIII, XXV-XXVI (inc.), XXXIV, XXXVI-XXXVII. Bulletins 83, 91. U. S. Bureau of Mines, Bulletin 71, Technical Paper 609. Eng. & Min. Jour.-Press, Vol. 121, pp. 837-842, May 22, 1926.

Bentonite produced in California during 1944 amounted to a total of 25,581 net tons, valued at \$180,065, and came from three properties in Inyo County, two properties in San Bernardino County; and one in Kern County. The 1944 output showed an increase in amount and value as compared with that of 1943, which was 11,480 tons, worth \$118,257, and came from two properties in San Bernardino County, and one each in Kern and San Diego counties.

Previous to 1931 the Division of Mines classed this material under the heading of 'fuller's earth,' but it was thought advisable to change the name to bentonite, owing to the fact that much bentonite is employed in uses that can not be classed as fuller's earth and therefore had been classified in these reports under pottery clay. This was somewhat confusing. Bentonite is the name commonly applied to the clays of the montmorillonite and halloysite group ('rock soap').

Fuller's earth includes many kinds of unctuous clays. It is usually soft, friable, earthy, nonplastic, white and gray to dark green in color, and some varieties disintegrate in water. Production has come mainly



from Calaveras and Solano counties, with other deposits noted also in Riverside, Fresno, Inyo and Kern counties.

#### Bentonite Production of California, by Years

Bentonite including a small amount of fuller's earth was first produced commercially in this State in 1899, and the total amount and value of the output since that time are as follows:

Year	Tons	Value	Year	Tons	Value
1899.....	620	\$12,400	1923.....	3,650	\$55,125
1900.....	500	3,750	1924.....	5,290	67,295
1901.....	1,000	19,500	1925.....	5,280	91,842
1902.....	987	19,246	1926.....	23,552	250,192
1903.....	250	4,750	1927.....	13,018	154,764
1904.....	500	9,500	1928.....	53,232	501,743
1905.....	1,344	38,000	1929.....	15,541	170,563
1906.....	440	10,500	1930.....	12,522	177,964
1907.....	100	1,000	1931.....	13,960	222,583
1908.....	50	1,000	1932.....	4,295	57,670
1909.....	459	7,385	1933.....	4,605	60,621
1910.....	340	3,820	1934.....	6,168	69,325
1911.....	466	5,294	1935.....	10,204	68,372
1912.....	876	6,500	1936.....	10,185	165,131
1913.....	460	3,700	1937.....	8,425	140,261
1914.....	760	5,928	1938.....	9,374	113,164
1915.....	692	4,002	1939.....	11,284	138,864
1916.....	110	550	1940.....	10,360	174,002
1917.....	220	2,180	1941.....	18,369	164,582
1918.....	37	333	1942.....	7,453	67,503
1919.....	385	3,810	1943.....	11,480	118,257
1920.....	600	6,000	1944.....	25,581	180,065
1921.....	1,185	8,295			
1922.....	6,606	48,756	Totals.....	285,914	\$2,771,988

#### CALCIUM SILICATE

*Bibliography:* State Mineralogist Report XXXIV, Mining and Metallurgy: Oct., 1935.

During 1944 no output of calcium silicate was reported in California but in 1941 one property in Kern County made some shipments to their mineral wool plant.

The annual details are concealed in the 'Unapportioned' item so as not to reveal its output.

The first commercial production of wollastonite was made in 1933 from a deposit operated by John T. Thorndyke in the Radamacher District in Kern County, and was shipped from Code's Siding to Los Angeles, where it was used to manufacture mineral wool. This was done by a new process in an electric furnace where the material is melted without the use of a flux and then blown to a fine fiber or wool by compressed air from jets. Mineral wool is an excellent insulating material for sound, heat and cold, and the manufacturer expects to use large quantities in proposed steel houses. This material, also, can be used in the manufacture of unbreakable glass.

Pyroxene is a silicate of calcium and magnesium and is found in crystalline limestone near the contact with intrusive igneous rocks and in basic igneous rocks such as gabbros. It is white to various shades of green, brown to black, having a hardness of 5 to 6 and a specific gravity 3.2 to 3.6.

Wollastonite is a calcium metasilicate ( $\text{CaSiO}_3$ ) and usually found in crystalline limestone at the contact with intrusive igneous rocks. It is a white to gray mineral, having a hardness of  $4\frac{1}{2}$  to 5 and a specific gravity of about 2.9.

Calcium silicate from 1934 to 1936 was classed in these California mineral production reports as wollastonite.

CARBON DIOXIDE GAS

*Bibliography:* State Mineralogist Reports XII, XXXVIII.

Carbon dioxide produced during 1943 in California came from wells operated by two companies near Niland, Imperial County, and by one company near Hopland, Mendocino County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of any individual company. The 1944 production showed a slight increase in both amount and value as compared with that of 1943, which was 227,424 M cu. ft. of carbon dioxide gas which was compressed to make 14,037 net tons of dry ice, valued at \$248,126.

Carbon dioxide gas is found many places in nature and is produced commercially from wells and springs whose waters are highly charged with the gas. It is used as a gas in the manufacture of carbonate beverages and dry ice, and in the chemical reduction of carbonates; as dry ice and liquefied as a refrigerant, as a source of power, and in the chemical industry. It has been stated that the amount of butyl rubber is only limited by the amount of dry ice available.

Carbon dioxide gas was first produced commercially in California in 1894. This material came from a drift on the 575 level of the Santa Isabel shaft of the New Almaden Quicksilver mine at Almaden, Santa Clara County. The drift was bulkheaded and a pipe was placed through the bulkhead for the gas to be drawn off, it then being compressed into cylinders and used in the manufacture of soda water.

In 1933 carbon dioxide gas was again produced, this time from wells drilled near Niland, Imperial County. On November 1, 1934, a dry-ice plant was put into operation for condensation of the carbon dioxide produced from the above wells.

Carbon Dioxide Gas Production in California, by Years

Year	M cubic feet	Value
1894.....	80	\$4,072
1895.....	800	12,000
1896.....	81	1,300
1897.....		
1933.....		
1934}*.....	15,440	1,822
1935.....		
1936}*.....	89,777	64,787
1937.....		
1938}*.....	131,189	13,799
1939.....		
1940.....	97,660	23,877
1941.....	135,862	258,563
1942.....	193,143	310,000
1943.....	227,424	248,126
1944.....	*	*
Totals.....	894,456	\$938,346

\* Annual details concealed under 'Unapportioned.'

## CLAY (Pottery)

*Bibliography:* State Mineralogist Reports I, IV, IX, XII-XV, XVIII-XXVIII (inc.), XXX-XXXIII (inc.), XXXV-XXXVII (inc.). Bulletins 38, 99. Preliminary Report No. 7, U. S. Bureau of Standards, Tech. Paper No. 262.

At one time or another in the history of the State, pottery clay has been mined in thirty-seven of its counties. Of these, 18 contributed in 1944. In this report, 'pottery clay' refers to all clays used in the manufacture of red and brown earthenware, china and sanitary ware, flower pots, floor, faience and ornamental tiling, architectural terra cotta, sewer pipe, drain and roof tile, etc., and the figures for amount and value are relative to the crude material at the pit without reference to whether the clay was sold in the crude form or was immediately used in the manufacture of any of the above finished products by the producer. It does not include clay used in making brick and hollow building blocks.

There are many other important uses for clay besides pottery manufacture. Among these may be enumerated paper, cotton goods, and chemicals. Clays of the montmorillonite and halloysite group ('rock soap') are being utilized successfully in the manufacture of soaps and for filtering oils and as oil-well drilling mud, also as an earth filler in irrigating ditches which run through porous ground.

Because of the fact that a given product often requires a mixture of several different clays, and that these are not all found in the same pit, it is necessary for most clay-working plants to buy some part of their raw materials from other localities. For these reasons, in compiling the clay industry figures much care is required to avoid duplications. So far as we have been able to segregate the figures, from the data sent in by the operatives, we have credited the clay output to the counties from which the raw material originated; and have deducted tonnages used in brick manufacture, as bricks are classified separately, herein.

During 1944 thirty-five properties operated in 18 counties in California, and reported an output of 491,363 net tons of pottery clay, valued at \$1,241,652, f.o.b. shipping point for crude material; as compared with 41 properties in 18 counties producing 622,019 tons, worth \$1,185,240 in 1943.

A tabulation of the direct returns from the producers, by counties, for the year 1944 is shown herewith:

## Pottery Clay in 1944

County	Tons	Value	Used in the manufacture of
Kern.....	<sup>b</sup> 152,237	\$522,711	Oil-well drilling mud.
Los Angeles.....	<sup>b</sup> 61,640	85,007	Red earthenware, chimney, drain and sewer pipe; vents; floor, mantel, and roofing tile, art pottery; oil-well drilling mud, and various.
Orange.....	<sup>a</sup> 34,627	140,316	Architectural terra cotta; conduits and segment blocks; electrical, porcelain, and chinaware; refractories; vents; drain, floor, and mantel tile; art pottery; and various.
Riverside.....	74,650	197,478	Conduit sewer, and drain pipe, red earthenware; faience, floor, mantel, roofing tile; refractory, and various.
San Bernardino.....	3,873	31,716	Roofing, floor and mantel tile; drain and sewer pipe; red earthenware; refractories; fire sand and various.
Alameda, Amador <sup>a</sup> , Calaveras, Humboldt, Marin, Placer, Sacramento, Santa Barbara, Santa Clara, Stanislaus, Sutter, Ventura <sup>b*</sup> .....	164,336	265,424	Architectural terra cotta, drain, roofing, and mantel tile; saggars; electrical porcelain; refractories; red earthenware; garden furniture; oil-well drilling mud; sewer, drain, and conduit pipe; prepared clay, light weight aggregate; and various.
Totals.....	491,363	\$1,241,652	

<sup>a</sup> Includes fire sand.<sup>b</sup> Includes oil-well drilling mud.

\* Combined to conceal the output of operators in each.

The above figures do not include clay reported as used in the manufacture of brick and hollow building tile or the bentonite clays, as these are included under separate headings.

## POTTERY CLAY PRODUCTS

The output of ceramic products manufactured in California during 1944 had a total value of \$11,744,124, as compared with \$13,817,552 in 1943. The distribution by products for 1944 is shown in the following tabulation:

Product	Number of producers	Tons	Value
Architectural terra cotta.....	3		\$110,333
Chimney pipe and flue lining.....	6	2,477	230,147
Drain pipe.....	10	6,886	111,470
Sewer pipe (glazed).....	9	96,019	3,040,116
Floor, faience, mantel, and handmade tile.....	9		1,654,598
Roofing tile.....	9	5,245	112,480
Red earthenware.....	4		92,031
Stoneware and chemical stoneware.....	4		226,627
Chinaware and semi-vitreous tableware.....	5		3,402,255
Conduit.....	3		88,975
Fire-clay and high temperature cements.....	6	15,366	309,305
Miscellaneous: electric-stove blocks, vents, art pottery, garden furniture, sanitaryware, and plumbing fixtures, electrical porcelain, glass tank backs, grog, dolls, fire tile, clay, shapes, light-weight aggregate, segment blocks, glazed flower-pots, glazed kitchen ware, sundries, specialties, and various.....	12		2,365,787
Total value.....			\$11,744,124

Of the ceramic products, increases in total value were registered in 1944 by faience, floor, mantel and handmade tile; roofing tile; and conduit; all others showed a decline in value.

## Pottery Clay Production of California, by Years

Amount and value of crude pottery clay output in California since 1887 are given in the following table:

Year	Tons	Value	Year	Tons	Value
1887	75,000	\$37,500	1917	166,298	\$154,602
1888	75,000	37,500	1918	112,423	166,788
1889	75,000	37,500	1919	135,708	245,019
1890	100,000	50,000	1920	203,997	440,689
1891	100,000	50,000	1921	225,120	362,172
1892	100,000	50,000	1922	277,232	473,184
1893	24,856	67,284	1923	376,863	697,841
1894	28,475	35,073	1924	417,928	651,857
1895	37,660	39,685	1925	537,587	674,376
1896	41,907	62,900	1926	801,461	806,509
1897	24,592	30,290	1927	867,419	872,661
1898	28,947	33,747	1928	887,807	1,394,950
1899	40,600	42,700	1929	839,949	1,127,527
1900	59,636	60,956	1930	938,586	795,517
1901	55,679	39,144	1931	332,680	408,931
1902	67,933	74,163	1932	167,284	204,890
1903	90,972	99,907	1933	141,629	211,711
1904	84,149	81,952	1934	190,510	245,900
1905	133,805	130,146	1935	240,014	377,969
1906	167,267	162,283	1936	382,823	646,920
1907	160,385	254,454	1937	354,669	705,200
1908	208,042	325,147	1938	304,564	582,608
1909	299,424	465,647	1939	305,517	611,599
1910	249,028	324,099	1940	324,399	687,871
1911	224,576	252,759	1941	551,347	1,217,363
1912	199,605	215,683	1942	622,958	1,200,293
1913	231,179	261,273	1943	622,019	1,185,240
1914	179,948	167,552	1944	491,363	1,241,652
1915	157,866	133,724			
1916	134,636	146,538	Totals	15,276,221	\$22,171,548

## DIATOMITE (Diatomaceous Earth)

*Bibliography:* State Mineralogist Reports II, XII-XV (inc.), XVII-XXVIII (inc.), XXXI-XXXIII, XXXV-XXXVI. Bulletins 38, 67, 91. Am. Inst. Min. Eng., Bull. 104, Aug. 1915, pp. 1539-1550. U. S. Bur. of Mines, Rep. of Investigations: Serial No. 2341, Jan. 1923. Eng. & Min. Jour.-Press, Vol. 115, pp. 1152-1154, June 30, 1923.

Diatomite, also known as diatomaceous earth, infusorial earth, tripolite and kieselguhr, is very light (when dry a cubic foot weighs 18 to 20 pounds) and extremely porous, chalk-like material composed of pure silica (chalk, being calcareous) which has been laid down under water and consists of the remains of microscopical infusoria and diatoms. The former are animal remains, and the latter are from plants.

The most important deposits in California thus far known are located in Los Angeles, Monterey, Orange, San Luis Obispo, and Santa Barbara counties. The diatomaceous earth of marine origin has proved of superior quality for filtration uses which bring the higher prices. Infusorial or diatomaceous earths are also found in Contra Costa, Fresno, Kern, Plumas, San Benito, San Bernardino, San Joaquin, Shasta, Sonoma, and Tehama counties.

As about 75 percent of the California output is from a single operator, we have concealed the exact figures under the 'Unapportioned' item in the State and county totals. There were three producing properties during 1944, two were in Santa Barbara County, and one in Los Angeles County. The shipments during the year showed a decrease in amount and value as compared with 1943.

The material shipped was utilized for insulation of both heat and sound, filtration, paint, pigment, cement admixture, filters, abrasives and for clarification of gasoline and kerosene.

#### Total Production of Diatomite in California

The first recorded production of these materials in California occurred in 1889; total amount and value of output, to date, are as follows:

Year	Tons	Value	Year	Tons	Value
1889.....	39	\$1,335	1918.....	35,963	\$189,459
1890.....			1919.....	40,200	217,800
1891.....			1920.....	60,764	1,056,675
1892.....			1921.....		
1893.....	50	2,000	1922.....	90,739	1,016,675
1894.....	51	2,040	1923.....		
1895.....			1924.....	193,064	5,729,736
1896.....			1925.....		
1897.....	5	200	1926.....		
1898.....			1927.....	275,403	1,995,923
1899.....			1928.....		
1900.....			1929.....		
1901.....			1930.....	300,017	4,848,661
1902.....	422	2,532	1931.....		
1903.....	2,703	16,015	1932.....		
1904.....	6,950	112,282	1933.....	203,228	3,104,154
1905.....	3,000	15,000	1934.....		
1906.....	2,430	14,400	1935.....		
1907.....	2,531	28,948	1936.....	290,908	4,243,572
1908.....	2,950	32,012	1937.....		
1909.....	500	3,500	1938.....		
1910.....	1,843	17,617	1939.....	266,358	3,941,941
1911.....	2,194	19,670	1940.....		
1912.....	4,129	17,074	1941.....		
1913.....	8,645	35,968	1942.....	425,745	6,692,051
1914.....	12,840	80,350	1943.....		
1915.....	12,400	62,000	1944.....	*	*
1916.....	15,332	80,649			
1917.....	24,301	127,510	Totals.....	2,285,694	\$33,567,549

\* Annual details concealed under 'Unapportioned.'

#### DOLOMITE

*Bibliography:* State Mineralogist Reports XV, XVII, XXVII, XXVIII, XXXI, XXXIII-XXXIV.

The output of dolomite in California during 1944 totalled 217,018 net tons, valued at \$619,425, and came from two properties in Monterey County and one each in San Benito and Tuolumne counties. The value of the 1944 production was the largest on record of any in this State. The 1943 production amounted to 331,251 tons, worth \$472,756.

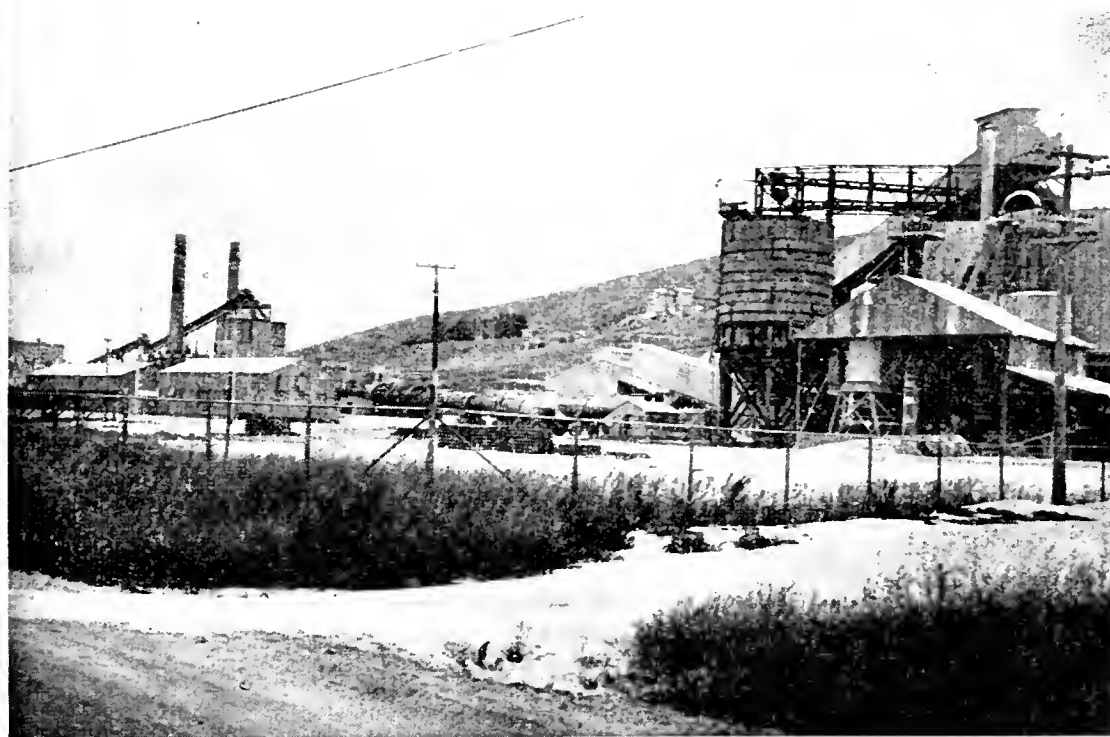
Most of the dolomite produced during the year was burnt to lime, this being used in the production of magnesia from sea water to be used in the reduction to magnesium metal and in magnesium refractories. Some of the raw dolomite was also used for steel-furnace flux and refractories, stucco dash, terrazzo and roofing granules, kalsomine, poultry grit, artstone, in the manufacture of mineral wool, and carbon dioxide.

#### Dolomite Production of California, by Years

Previous to the 1915 statistical report of the State Mining Bureau, dolomite was included under limestone, as the two minerals are closely related chemically; but since dolomite, as such, has been found to have certain distinctive applications, we here give it a separate classification.



Dolomite Quarry of Permanente Metals Company, at Natividad, Monterey County  
Photo by Walter W. Bradley



Dolomite Calcining Plant of Permanente Metals at Natividad, Monterey County  
Photo by Walter W. Bradley

Amount and value of the output of dolomite, annually, have been as follows:

Year	Tons	Value	Year	Tons	Value
1915.....	4,192	\$14,504	1932.....	35,275	\$40,956
1916.....	13,313	46,566	1933.....	54,456	176,575
1917.....	27,911	66,416	1934.....		
1918.....	24,560	79,441	1935)*.....	108,645	304,984
1919.....	24,502	67,953	1936.....	25,807	63,102
1920.....	42,388	132,791	1937.....	12,371	24,632
1921.....	31,195	99,155	1938.....	4,363	18,339
1922.....	52,409	114,911	1939.....	17,791	40,391
1923.....	69,519	142,615	1940.....	18,178	52,167
1924.....	28,843	71,271	1941.....	22,300	64,595
1925.....	42,852	104,900	1942.....	142,552	413,469
1926.....	68,640	119,313	1943.....	331,251	472,756
1927.....	45,976	79,442	1944.....	217,018	619,425
1928.....	38,379	85,342			
1929.....	58,644	156,928	Totals.....	1,729,894	\$3,834,175
1930.....					
1931)*.....	66,564	161,245			

\* Annual details concealed under 'Unapportioned.'

### FELDSPAR

*Bibliography:* State Mineralogist Reports XV, XVII-XXVIII (inc.), XXX, XXXI, XXXIV-XXXVII (inc.). Bulletins 67, 91. U. S. Bureau of Mines, Bulletin 92. Eng. & Min. Jour.-Press, Vol. 115, pp. 535-538, Mar. 24, 1923.

During 1944 feldspar was produced and shipped from two properties in California, one each in Fresno and San Bernardino counties, the annual details being concealed under the 'Unapportioned' item to conceal the output of a property. The production showed a decrease in amount and value from the previous year.

The 1943-1944 total output of feldspar was 4,090 net tons valued at \$11,152. Also produced is a large tonnage of glass feldspar which is contained in sands coming from Contra Costa, Monterey, and Riverside counties and is reported under glass sand and computed under silica, as the largest percentage of these sands is quartz. In 1944 from San Diego County was reported an output of feldspar which was stock-piled on the property, therefore the production was not included in the annual figures.

The requirements of the pottery trade demand that in general the percentage of free silica associated with the feldspar be less than 20 percent, and in some cases the potters specify less than 5 percent. An important factor, also, is the iron-bearing minerals frequently present in pegmatites and granites, such as biotite (black mica), garnet, hornblende and black tourmaline. Feldspar for pottery uses should be practically free of these. The white, potash-mica, muscovite, is not particularly objectionable except that being in thin, flexible plates, it does not readily grind to a fineness required for the feldspar. Feldspar is also used in the manufacture of glass, enamel and sanitary ware, in soaps and abrasives, and as a binder for abrasive wheels, etc., all of which have similar specifications to that for pottery.

### Total Feldspar Production in California

Total amount and value of feldspar production in California since the inception of the industry are given in the following table, by years:



Year	Tons	Value	Year	Tons	Value
1910.....	760	\$5,720	1929.....	13,327	\$78,404
1911.....	740	4,560	1930.....	5,014	35,654
1912.....	1,382	6,180	1931.....	4,795	59,921
1913.....	2,129	7,850	1932.....	2,294	15,988
1914.....	3,530	16,565	1933}*.....		
1915.....	1,800	9,000	1934}*.....	2,655	30,611
1916.....	2,630	14,350	1935.....	3,265	21,855
1917.....	11,792	46,411	1936.....	3,430	24,959
1918.....	4,132	22,061	1937.....	2,686	10,930
1919.....	1,272	12,965	1938.....	1,378	6,970
1920.....	4,518	26,189	1939.....	2,076	12,510
1921.....	4,349	28,343	1940.....	3,022	16,644
1922.....	4,587	37,109	1941}*.....		
1923.....	11,100	81,800	1942}*.....	10,040	56,718
1924.....	9,055	68,112	1943}*.....		
1925.....	8,165	59,615	1944}*.....	4,090	11,152
1926.....	7,300	56,400			
1927.....	10,932	86,101	Totals.....	163,863	\$1,065,397
1928.....	14,628	93,745			

\* Annual details concealed under 'Unapportioned.'

### FLUORSPAR

*Bibliography:* State Mineralogist Reports XVII, XVIII, XIV, XXVI. Bulletins 67, 91. Eng. & Min. Jour.-Press, Vol. 177, pp. 489-492, Mar. 22, 1924.

During 1944 there was a small amount of fluorspar shipped from the Red Bluff Fluorspar Mine 14 miles south of Rice, Riverside County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual operator.

Fluorspar, or calcium fluoride,  $\text{CaF}_2$ , is one of the most important nonmetallic minerals from an industrial standpoint. About 80 percent of the commercial mineral is prepared in the 'gravel' form and utilized as a flux in the manufacture of steel, for which use no substitute has yet been found.

In California deposits have been reported in Los Angeles, Mono, Riverside and San Bernardino counties. A previous commercial production was made in 1917-1918, when a total of 79 tons valued at \$991 was shipped from Riverside County, and in 1933-1934 with 227 tons worth \$3,631 coming from San Bernardino County.

Present quotations (Metal and Mineral Markets, Sept. 13, 1945) are: not less than 85 percent  $\text{CaF}_2$  and not over 5 percent  $\text{SiO}_2$ , \$33 per ton; No. 2 lump, \$33 per ton, and acid grade 97.5 percent  $\text{CaF}_2$ , \$37 f.o.b. mine.

### GEMS

*Bibliography:* State Mineralogist Reports II, XIV, XV, XVII, XVIII, XX, XXI-XXVIII (inc.), XXX-XXXII (inc.), XXXIV-XXXV. Bulletins 37, 67, 91. U. S. G. S., 'Mineral Resources of the U. S.'; Bull. 603, p. 208. Bull. Dept. Geo. Univ. of Cal., Vol. 5, pp. 149-153, 331-380. Am. Jour. Sci., Vol. 31, p. 31.

The production of gem materials in California has been somewhat irregular and uncertain since 1911. The compilation of complete statistics is difficult owing to widely-scattered places at which stones are gathered and marketed, for the most part in a small way. The gem material reported mined and shipped during 1944 in California came

from a single property each in Calaveras and Tulare counties, the annual details are concealed under the 'Unapportioned' item so as not to reveal the output of either operator. The material reported in 1944 was all optical and piezoelectric quartz. The 1943 output to a total value of \$329,868 and came from properties in Fresno, Calaveras, Imperial, San Bernardino, and Stanislaus counties and consisted of bloodstone, iceland spar, optical quartz and topaz. The higher figure for 1943 was due to shipments of optical and piezoelectric grades of quartz.

#### Varieties of California's Gem Stones

*Diamonds* have been found in a number of localities in California; but in every case, they have been obtained in stream gravels while working them for gold. The principal districts have been: Volcano in Amador County; Placerville, Smith's Flat and others in El Dorado County; French Corral, Nevada County; Cherokee Flat, Morris Ravine, and Yankee Hill, Butte County; Gopher Hill and upper Spanish Creek, Plumas County. The most productive district of recent years has been Cherokee in Butte County.

California *tourmalines* are decidedly distinctive in coloring and 'fire' as compared to foreign stones of this classification. The colors range from deep ruby to pink, and various shades of green, also blue.

One of our California gem stones, *benitoite*, has not been found elsewhere; and in but a single locality here: The Dallas Mine in San Benito County.

*Kunzite*, a gem variety of spodumene, was first found in the Pala district in San Diego County. It has thus far been found in only one locality (Madagascar) outside of California. It is of a lilac color, and is described in detail in Bulletin 37 of the State Mining Bureau.

*Beryls* of excellent fire and delicate colors are also obtained in the pala district, of which the *aquamarine* (blue) and *morganite* (pink) varieties deserve special mention. Morganite, like kunzite, has thus far been found elsewhere only in Madagascar.

*Californite*, or 'California jade,' is a gem variety of *idorase* (*vesuvianite*), and is green or white in color. It is found in Butte, Fresno, and Siskiyou counties.

Stones of precious blue *topaz* of fine quality are being cut from crystals mined in northern San Diego County. They are associated with beryl and blue tourmaline.

Some *rhodonite* has been mined in Siskiyou County, and used for decorative purposes, its value being included in the marble figures.

*Garnets* are found in a number of localities in California; the important yield of gems being *hyacinth* and *spessartite* varieties from San Diego County.

*Chrysoprase* has been produced in Tulare County.

*Turquoise* has been found in the desert section of San Bernardino County, but none produced commercially in recent years.

*Sapphires* have been reported found in San Bernardino and Riverside counties, but not as yet confirmed. A few have been found in stream gravels with diamonds in Butte County.

*Rubies* have been identified by the laboratory of the State Mining Bureau, occurring in limestone from the Baldy Mountains, San Bernardino County. Thus far no stones of commercial size have been taken out.

## Total Production of Gem Materials in California

The value of the gem output in California annually since the beginning of commercial production is as follows:

Year	Value	Year	Value
1900.....	\$20,500	1924.....	\$4,800
1901.....	40,000	1925.....	10,663
1902.....	162,100	1926.....	9,049
1903.....	110,500	1927.....	7,035
1904.....	136,000	1928.....	22,200
1905.....	148,500	1929.....	26,850
1906.....	497,090	1930.....	3,540
1907.....	232,642	1931.....	5,607
1908.....	208,950	1932.....	4,961
1909.....	193,700	1933.....	690
1910.....	237,475	1934.....	2,456
1911.....	51,824	1935.....	945
1912.....	23,050	1936.....	2,878
1913.....	13,740	1937.....	2,075
1914.....	3,970	1938.....	4,575
1915.....	3,565	1939.....	2,500
1916.....	4,752	1940.....	3,176
1917.....	3,049	1941.....	870
1918.....	650	1942.....	570
1919.....	5,425	1943.....	329,868
1920.....	36,056	1944.....	*
1921.....	10,954	Total.....	\$2,604,232
1922.....	1,312		
1923.....	13,220		

\* Concealed under unapportioned.

## GRAPHITE

*Bibliography* State Mineralogist Reports XVIII, XIV, XV, XVII, XXVI (inc.), XXX, XXXIII, XXXV. Bulletins 67, 91. U. S. G. S., Min. Res. 1914, Pt. II.

Graphite (also called plumbago) has been produced from time to time in the State, coming principally from Sonoma and Los Angeles counties.

Occurrences of graphite have been reported at various times from Calaveras, Fresno, Imperial, Inyo, Los Angeles, Mendocino, San Bernardino, San Diego, Siskiyou, Sonoma and Tuolumne counties. From 1931 to 1933 there was a small production of graphite from a property in Los Angeles County.

During 1943 no production of graphite was reported in California. In 1935 there was a small output of graphite coming from a single property in Los Angeles County. This material was used for experimental purposes. The annual details are concealed under the 'Unapportioned' item in order not to reveal the output of the single operator.

The principal value of graphite is on account of its infusibility and resistance to the action of molten metals. It is also largely used in the manufacture of electrical appliances, of 'lead' pencils, as a lubricant, as stove polish, paints and in many other ways. Amorphous graphite, commonly carrying many impurities, brings a much lower price. For some purposes, such as foundry facings, etc., the low-grade material is satisfactory. Among the interesting uses for graphite is the prevention of formation of scale in boilers. The action is a mechanical one. Being soft and slippery, the graphite prevents the particles of scale from adhering to one another or to the boiler and they are thus easily removed.

**Graphite Production of California, by Years**

According to the records of the State Mining Bureau, the graphite production of California, by years, has been as follows :

Year	Pounds	Value	Year	Pounds	Value
1901.....	128,000	\$4,480	1923.....		
1902.....	84,000	1,680	1925.....		
1903.....			1926.....	*76,000	\$13,120
1913.....	2,500	25	1927.....		
1914.....			1928.....		
1915.....			1931.....		
1916.....	29,190	2,335	1932.....	*156,000	1,950
1917.....			1933.....		
1918.....			1934.....		
1919.....*	770,000	37,225	1935.....	104,000	520
1920.....			1936.....		
1921.....					
1922.....*	624,000	26,160	Totals.....	1,973,690	\$87,495

\* Annual details concealed under 'Unapportioned,' on account of a single producer.

**GYPSUM**

*Bibliography:* State Mineralogist Reports XIV, XV, XVII, XVIII, XXII, XXIII, XXV-XXVIII (inc.), XXX, XXXI, XXX-XXXVI (inc.). Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 223, 413, 430, 697. U. S. Bur. of Standards, Circular No. 281.

Shipments of gypsum in California during 1944 amounted to a total of 558,488 net tons, valued at \$949,833, and came from four properties in Kern County; two each in Imperial and Ventura counties; and one in Riverside County. The 1944 output was an increase in amount and value as compared with 475,967 net tons, worth \$916,883 in 1943.

In addition to the above figures a considerable amount of gypsum came from Alameda County, which was obtained in a chemical process for reducing magnesium salts from salt-works bittern water with lime, the amount of which was not included in the above figures as it was used with lime and magnesite. The 1944 figures showed the largest annual output ever reported in this State. Gypsum mined in this State was used in the manufacture of hard-wall and other plasters, in cement, and for agricultural purposes. The increase in recent years in the uses of this material is chiefly in the agricultural field, the tonnage for which now exceeds that for industrial and structural plasters, and that used in cement.

**Uses**

The most important use of gypsum from the quantity standpoint is in the calcined form where it is utilized in the manufacture of various hard-wall plasters and plaster board. As plaster of paris, it plays a very important part in surgical work. Approximately 2%, by weight, raw gypsum is added in the manufacture of Portland cement just before the final grinding. In this application, the gypsum acts as a retarder to the set of the cement. The use of gypsum tile for non-bearing fireproof partitions, stairway and elevator enclosures, and the protection of steel columns, girders and beams, has increased greatly.

Keene's cement is a gypsum product, calcined to complete dehydration, and an accelerator added such as alum, potassium sulphate, borax, aluminum sulphate.

Land plaster may be applied to the soil by drilling, or scattered in the hill, or it may be sowed broadcast, in quantities ranging from 200 to 500 pounds to the acre.

#### Total Production of Gypsum in California

Production of gypsum annually in California since such records have been compiled by this Bureau is as follows:

Year	Tons	Value	Year	Tons	Value
1887.....	2,700	\$27,000	1917.....	30,825	\$56,840
1888.....	2,500	25,000	1918.....	19,695	37,176
1889.....	3,000	30,000	1919.....	19,813	50,579
1890.....	3,000	30,000	1920.....	20,507	92,535
1891.....	2,000	20,000	1921.....	37,412	78,875
1892.....	2,000	20,000	1922.....	47,084	188,336
1893.....	1,620	14,280	1923.....	86,410	289,136
1894.....	2,446	24,584	1924.....	25,569	53,210
1895.....	5,158	51,014	1925.....	107,613	172,444
1896.....	1,310	12,580	1926.....	114,868	211,337
1897.....	2,200	19,250	1927.....	94,630	292,090
1898.....	3,100	23,600	1928.....	104,790	200,567
1899.....	3,663	14,950	1929.....	140,844	396,951
1900.....	2,522	10,088	1930.....	116,865	243,507
1901.....	3,875	38,750	1931.....	88,354	199,198
1902.....	10,200	53,500	1932.....	46,867	93,818
1903.....	6,914	46,441	1933.....	59,235	120,451
1904.....	8,350	56,592	1934.....	58,149	113,606
1905.....	12,859	54,500	1935.....	70,833	151,807
1906.....	21,000	69,000	1936.....	143,549	282,703
1907.....	8,900	57,700	1937.....	186,160	384,431
1908.....	34,600	155,400	1938.....	161,996	327,821
1909.....	30,700	138,176	1939.....	219,672	437,343
1910.....	45,294	129,152	1940.....	314,843	599,944
1911.....	31,457	101,475	1941.....	432,784	854,184
1912.....	37,529	117,388	1942.....	425,268	791,892
1913.....	47,100	135,050	1943.....	475,967	916,883
1914.....	29,734	78,375	1944.....	558,488	949,833
1915.....	20,200	48,953			
1916.....	33,384	59,533	Totals.....	4,629,394	\$10,249,828

#### LIMESTONE

*Bibliography:* State Mineralogist Reports IV, XII-XV (inc.), XVII-XXXI (inc.), XXXIII-XXXV (inc.), XXXVII. Bulletins 38, 91. Oregon Agr. College Extension Bulletin 305. Eng. and Min. Jour.-Press, Vol. 120, pp. 249-253.

'Industrial' limestone was shipped from 18 properties in 10 counties in California during 1944, and totalled 734,425 net tons, valued at \$1,714,414, as compared with 495,262 tons, worth \$1,378,647 in 1943, which came from 19 properties in 11 counties. Distribution of the 1944 output by counties was as follows:

County	Tons	Value
San Bernardino.....	387,458	633,063
Santa Clara <sup>a</sup> .....	82,925	223,851
El Dorado, Inyo, Riverside, San Mateo <sup>a</sup> , Santa Cruz, Sonoma <sup>a</sup> , Tuolumne, Ventura <sup>*</sup> .....	264,042	857,500
Totals.....	734,425	\$1,714,414

<sup>a</sup> Includes shells dredged from San Francisco Bay.

<sup>\*</sup> Combined to conceal the output of operators in each.

Included in the above figures were 164,494 tons of limestone used in making 82,247 net tons of lime, valued at \$883,009, which came from two properties in San Bernardino County and one each in Alameda, El Dorado, and Tuolumne counties. The figures for lime do not include lime burnt from dolomite and used in the reduction of magnesia from sea water. Dolomite is treated as a separate mineral substance. In 1943 there were 172,664 tons of limestone burnt to make 86,332 net tons of lime, worth \$922,800. Also included were 102,220 tons of limestone, valued at \$556,973, which was used for agricultural purposes and poultry grit, stock feed and as a filler in fertilizers.

The amount here does not include the limestone used in the manufacture of cement nor for macadam and concrete, but accounts for that utilized as smelter and foundry flux, for glass and sugar making, other special chemical and manufacturing processes and burned for lime. It also includes that utilized for fertilizers (agricultural 'lime'), 'roofing gravel,' paint and concrete filler, whiting for paint, putty, kalsomine, terrazzo, paving dust, chicken grit, stock feed, carbon dioxide gas, oilwells, mineral wool, 'paving compound,' facing dust for concrete pipe, also for rubber and magnesite mix.

The above limestone for 1944 was produced by four companies in San Bernardino County; three in Santa Clara County; two each in El Dorado, Santa Cruz and Tuolumne counties; and one each in Inyo, Riverside, San Mateo, Sonoma, and Ventura counties. The material from San Mateo and Sonoma counties and part from Santa Clara County was shells, dredged from San Francisco Bay, which were ground and used for agricultural purposes, chemical purposes, and for poultry grit.

#### Limestone Production of California, by Years

The following tabulation gives the amounts and values of 'industrial' limestone produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. These tonnages consist principally of limestone utilized for flux, glass and sugar making, agricultural, chemical, and other special industrial purposes. That utilized in cement manufacture is not included: Beginning with 1942 the limestone used in the manufacture of burnt lime was included with these figures, instead of being kept separate as a structural material, as most of the lime is being used in metallurgical and chemical industry, and not in construction as in previous years.

Year	Tons	Value	Year	Tons	Value
1894	15,420	\$19,275	1921	75,921	\$305,912
1895	71,355	71,690	1922	84,382	282,181
1896	68,184	71,112	1923	143,266	348,464
1897	36,796	38,556	1924	219,476	582,660
1898	27,686	24,548	1925	319,977	494,525
1899	30,769	29,185	1926	108,795	367,501
1900	32,791	31,532	1927	699,790	663,957
1901	76,937	99,445	1928	127,895	397,935
1902	71,422	90,524	1929	168,315	557,617
1903	125,919	163,988	1930	169,477	508,751
1904	40,207	87,207	1931	177,268	560,699
1905	192,749	323,325	1932	168,950	487,788
1906	80,262	162,827	1933	207,371	487,712
1907	230,985	406,041	1934	198,057	461,139
1908	273,890	297,264	1935	227,214	496,054
1909	337,676	419,921	1936	295,792	661,757
1910	684,635	581,208	1937	351,755	830,562
1911	516,398	452,790	1938	302,665	729,149
1912	613,375	570,248	1939	316,029	838,235
1913	301,918	274,455	1940	563,999	895,832
1914	572,272	517,713	1941	459,153	801,868
1915	146,324	156,288	1942	474,764	1,155,352
1916	187,521	217,733	1943	495,262	1,378,647
1917	237,279	356,396	1944	734,425	1,714,414
1918	208,566	456,258			
1919	88,291	248,145			
1920	90,120	298,197			
			Totals	12,448,735	\$22,473,582

## LITHIA

*Bibliography:* State Mineralogist Reports II, IV, XIV, XXI, XXX, XXXV. Bulletins 38, 67, 91.

During 1944 lithium salts were again produced in California; but coming from a single property, the figures are concealed under the 'Unapportioned' item. The 1944 output showed an increase in amount and value over that reported for 1943.

Starting with 1938, material comes from the brines of Searles Lake in San Bernardino County at the plant of the American Potash and Chemical Corporation, in the form of sodium-lithium phosphate, and is the first output of this form, previous production being the mineral lepidolite.

Lithia mica, lepidolite (a silicate of lithium and others), utilized in the manufacture of artificial mineral water, fireworks, glass, etc., has been mined in San Diego County since 1899, except between 1905 and 1915, though there was none shipped in 1923, 1925, 1929-1943 (inc.). During 1930 there was a small amount of lepidolite mined in California, but not shipped. Some amblygonite, a lithium phosphate, is occasionally also obtained from pockets associated with the gem tourmalines.

Lithia minerals total production in the State has been as follows:

Year	Tons	Value	Year	Tons	Value
1899	124	\$4,600	1923		
1900	440	11,000	1924	109	\$2,269
1901	1,100	27,500	1925		
1902	822	31,880	1926		
1903	700	27,300	1927	550	13,900
1904	641	25,000	1928		
1905	25	276	1929		
1906			1938		
1915	91	1,365	1939	378	100,338
1916	71	1,065	1940		
1917	880	8,800	1941	366	84,099
1918	4,111	73,998	1942		
1919	800	14,400	1943	478	114,148
1920	10,046	153,502	1944	*	*
1921)*					
1922)	1,365	20,781	Totals	23,097	\$716,221

\* Annual details concealed under 'Unapportioned.'

### MICA

*Bibliography:* State Mineralogist Reports II, IV, XXVI-XXVIII (inc.), XXX, XXXIII-XXXVI (inc.). Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 740; Min. Res. of U. S. Eng. & Min. Jour.-Press, Vol. 115, pp. 55-60, Jan. 13, 1923.

Sericite, a fine-grained variety of Muscovite, has been produced continuously since 1929 in California with the exception of 1934, 1939, 1942, and 1943. The 1944 shipments came from a single property in Imperial County and was sericite mica schist. In addition there was a small amount of scrap mica mined in San Diego County which was stock-piled and none was shipped from property.

The annual details are concealed in the 'Unapportioned' items so as not to reveal production of the individual operators. The material mined during the year was sericite. Sericite is used as a cheap grade of ground mica for roofing, as a refractory, foundry facing, and decorative material to imitate snow. A small amount of vermiculite, a hydrous mica, expanded by heating and then used as an insulating agent, was mined in 1936.

### Classification and Uses

Practically all marketable mica is of the muscovite or phlogopite varieties. There are three main commercial classes: Sheet mica, including punch; splittings, and scrap. Sheet mica is used chiefly for electrical purposes and for glazing; splittings are made into built-up mica; scrap is ground to a powder. Mica to be classified as sheet must yield a rectangle of at least  $1\frac{1}{2} \times 2$  in., must split evenly and freely, be free from cracks, rulings, or plications, and reasonably free from inclusions of foreign matter, though stains of a nonconducting character are permissible for some uses. Ability to withstand heat and high electrical resistance have led to a wide application of sheet mica in the electrical industries. The electrical uses of sheet mica greatly exceed all others in quantity and value of the material used.

As a heat-resisting transparent medium, sheet mica has various uses. It is widely employed for stove windows, though this use has



declined to a considerable extent. A hard and rigid mica that is nearly clear is best suited for stove fronts. High-grade stove mica commands a higher price than electrical mica, because for the most part larger sizes are demanded. Mica is also used in furnace and bake-oven sight-holes, heat screens, lamp chimneys, canopies and shades, particularly for gas mantels, and also for military lanterns and in lantern slides.

Its ability to withstand shocks and strains, combined with its transparency, has led to wide use in spectacles, drivers' helmets, smoke helmets, compass cards, gage fronts, and in windows subject to shock, as in the conning towers of warships. On account of its heat-resisting qualities, ground mica is used in railroad car axle packings, foundry facing in pipe and boiler coverings, in fireproof paints, and in rubber tires. Ground mica is used as a component in roofing, as a filler in rubber and other products, in foundry facing, calico printing and as a tire powder. It is used also in tinsel decorations, and as 'Santa Claus snow' for Christmas tree and window decorations. It is used as a lubricant for wooden bearings, and mixed with oil for metal bearings.

The vermiculite variety is any of several hydrous mica minerals which expand upon heating. In recent years they have become valuable as an insulating agent for both heat and sound, when being expanded it often takes on a gold or silver color and is used in window decoration.

Production of mica in California has been as follows:

Year	Tons	Value	Year	Tons	Value
1902.....	50	\$2,500	1937}		
1903.....	50	3,800	1938)*.....	4,969	\$31,751
1904.....	50	3,000	1939.....		
1929.....			1940}		
1930)*.....	2,240	15,260	1941)*.....	1,469	11,050
1931.....			1942.....		
1932)*.....	1,957	13,963	1944.....	*	*
1933)*.....					
1934.....			Totals.....	14,618	\$96,974
1935.....					
1936)*.....	3,833	15,650			

\* Annual details concealed under 'Unapportioned.'

#### MINERAL PAINT

*Bibliography:* State Mineralogist Reports XII-XIX (inc.), XXI, XXII-XXVIII (inc.), XXXV, XXXVII. Bulletins 38, 91.

During 1943 in California shipments of mineral paint were made from a single property each in Madera and San Bernardino counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of the individual producer. The 1943-1944 total output was 590 short tons valued at \$7,700. The 1943 output came from a single property in Stanislaus County.

These materials have come from Alameda, Amador, Butte, Calaveras, Colusa, Los Angeles, Napa, Nevada, Placer, Riverside, Shasta, Sonoma, Stanislaus and Ventura counties. There are also other deposits that may have possible commercial value, but as yet there have been no commercial shipments from El Dorado, Imperial, Kern, Kings, Lake, Mendocino, San Diego, Siskiyou, Trinity, and Yuba counties, in which they are found.

## Mineral Paint Production of California, by Years

The first recorded production of mineral paint materials in the State was in the year 1890. The output, showing annual amount and value since that time, is given herewith:

Year	Tons	Value	Year	Tons	Value
1890.....	40	\$480	1917.....	520	\$2,700
1891.....	22	880	1918.....	728	4,738
1892.....	25	750	1919.....	1,780	17,055
1893.....	590	26,795	1920.....	779	8,477
1894.....	610	14,140	1921.....	446	4,748
1895.....	750	8,425	1922.....	1,620	13,277
1896.....	395	5,540	1923.....	1,049	11,773
1897.....	578	8,165	1924.....	532	5,234
1898.....	653	9,698	1925.....	669	6,969
1899.....	1,704	20,294	1926.....	569	5,846
1900.....	529	3,993	1927.....		
1901.....	325	875	1928)*.....	919	9,592
1902.....	589	1,533	1929.....	467	2,820
1903.....	2,370	3,720	1930.....		
1904.....	270	1,985	1931)*.....	250	3,000
1905.....	754	4,025	1932.....		
1906.....	250	1,720	1933.....		
1907.....	250	1,720	1935)*.....	570	5,500
1908.....	335	2,250	1936.....		
1909.....	305	2,325	1937.....	855	5,193
1910.....	200	2,040	1938.....		
1911.....	186	1,184	1941.....		
1912.....	300	1,800	1942)*.....	145	1,458
1913.....	303	1,780	1943.....		
1914.....	132	847	1944)*.....	590	7,700
1915.....	311	1,756			
1916.....	643	3,960	Totals.....	22,307	\$241,999

\* Annual details concealed under 'Unapportioned.'

## MINERAL WATER

*Bibliography:* State Mineralogist Reports VI, XII-XVIII (inc.), XXI-XXIX (inc.), XXXI, XXXIII (inc.), XXXV-XXXVII (inc.), U. S. G. S. Water Supply Paper 338. Min. Res., 1914, 1916. 'Mineral Springs and Health Resorts of California' by Dr. Winslow Anderson, 1890. U. S. Dept. of Agr., Bur. of Chem., Bulletin 91.

A widespread production of mineral water is shown annually in California. These figures refer to mineral water actually bottled for sale, or for local consumption. Water from some of the springs having a special medicinal value brings a price many times higher than the average shown, while in some cases the water is used merely for drinking purposes and sells for a nominal figure. Health and pleasure resorts are located at many of the springs. The waters of some of the hot springs are not suitable for drinking, but are very efficacious for bathing. From a therapeutic standpoint, California is particularly rich in mineral springs.

The commercial output of mineral water in California during 1944 amounted to 24,445,814 gallons valued at \$812,645, as compared with 22,022,314 gallons worth \$814,700 in 1943. The 1944 output came from springs and well on 30 properties in 15 counties and was distributed as follows:

County	Gallons	Value
Lake.....	7,185	\$2,956
Los Angeles.....	11,536,996	383,317
Butte, Calaveras, Contra Costa, Marin, Napa, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Shasta, Siskiyou, Sonoma*.....	12,901,633	426,372
Totals.....	24,445,814	\$812,645

\* Combined to conceal the output of producers in each.

The production above tabulated came either from springs or artesian wells and was bottled, in part with artificial carbonation, but mostly natural, and sold for drinking purposes. A large part was used in the preparation of soft drinks with flavors.



Paraiso Hot Springs, Monterey County

Photo by Walter W. Bradley

#### Mineral Water Production of California, by Years

Mineral water was bottled for sale, at the Napa Soda Springs, Napa County, as early as 1856,<sup>1</sup> and at other springs in California, notably The Geysers, Sonoma County, also at early dates; but there are no figures available earlier than the year 1887. Amount and values, annually, since that year are shown herewith:

<sup>1</sup> Cronise, T. F., The natural wealth of California, p. 182, 1868.

Year	Gallons	Value	Year	Gallons	Value
1887	618,162	\$144,368	1917	1,942,020	\$340,566
1888	1,112,202	252,990	1918	1,808,791	375,650
1889	808,625	252,241	1919	2,233,842	340,117
1890	258,722	89,786	1920	2,391,791	421,643
1891	334,553	139,959	1921	3,446,278	367,476
1892	331,875	162,019	1922	4,276,346	486,424
1893	383,179	90,667	1923	5,487,276	616,919
1894	402,275	184,481	1924	8,159,211	818,726
1895	701,397	291,500	1925	12,115,072	1,230,455
1896	808,843	337,434	1926	14,074,877	1,171,550
1897	1,508,192	345,863	1927	16,644,423	1,487,183
1898	1,429,809	213,817	1928	25,049,002	1,304,969
1899	1,338,537	406,691	1929	27,032,083	2,040,615
1900	2,456,115	268,607	1930	37,354,111	2,870,663
1901	1,555,328	559,057	1931	26,164,331	1,347,860
1902	1,701,142	612,477	1932	19,031,224	1,495,988
1903	2,056,340	558,201	1933	15,650,406	719,746
1904	2,430,320	496,946	1934	19,882,436	1,071,197
1905	2,194,150	538,700	1935	16,659,254	940,333
1906	1,585,690	478,186	1936	19,348,513	777,899
1907	2,924,269	544,016	1937	18,309,729	1,130,810
1908	2,789,715	560,507	1938	26,900,959	853,998
1909	2,449,834	465,488	1939	16,678,741	735,988
1910	2,335,259	522,009	1940	16,190,549	960,701
1911	2,637,669	590,654	1941	17,746,256	988,520
1912	2,497,794	529,384	1942	17,559,686	567,897
1913	2,350,792	599,748	1943	22,022,314	814,700
1914	2,443,572	476,169	1944	24,445,814	812,645
1915	2,274,267	467,738			
1916	2,273,817	410,112			
			Totals	587,597,789	\$38,771,052

### PHOSPHATES

*Bibliography:* State Mineralogist Report XXI. Bulletins 67, 91.

No commercial production of phosphates has been recorded from California, though occasional pockets of the lithium phosphate, amblygonite,  $\text{Li (AlF) PO}_4$ , have been found associated with the gem tourmaline deposits in San Diego County. Such production has been classified under lithia. In 1938, recovery began on a commercial scale of sodium-lithium phosphate at the plant of the American Potash and Chemical Corporation, at Searles Lake, San Bernardino County. However, the product is sold for its lithium content rather than the phosphate, hence we record it under Lithia.

### PUMICE and VOLCANIC ASH

*Bibliography:* State Mineralogist Reports XII, XIV, XV, XVII, XVIII, XXII-XXV (inc.), XXX-XXXII (inc.), XXXIV-XXXVIII (inc.). Bulletin 38. U. S. Bureau of Mines, I. G. 6560. (See 'Tufa'.)

The output of pumice and volcanic ash during 1944 in California amounted to a total of 34,525 net tons, valued at \$272,064 f.o.b. rail shipping point, compared with 21,154 tons worth \$142,665 in 1943.

The 1944 output was made up of 10,238 net tons of volcanic ash, worth \$122,900 which came from two properties in Kern County and one each in Madera and San Luis Obispo counties; and 24,287 net tons of pumice, worth \$149,164, which came from three properties in Inyo County, two each in Mono and Siskiyou counties, and one each in Madera, Modoc, and Napa counties. A small amount of the material classed as pumice coming from Siskiyou County was scoria.

The lump pumice was used for light-weight aggregate in concrete, acoustic plaster, abrasives, scouring bricks, insulating, and hen-house litter; while the volcanic ash or tuff was employed in making soap, cleanser compounds, as a filler in concrete, in asphalt, and as a carrier for insecticides in dry agricultural sprays. A portion of the Kern County ash is going into the preparation of one of the nationally advertised brands of cleanser compounds.

#### Pumice Production of California, by Years

Commercial production of pumice in California was first reported to the State Mining Bureau in 1909, then not again until 1912, since which year there has been a small annual output, as indicated by the following table:

Year	Tons	Value	Year	Tons	Value
1909.....	50	\$500	1928.....	10,440	\$105,055
1910.....			1929.....	10,449	76,123
1911.....			1930.....	12,947	128,847
1912.....	100	2,500	1931.....	11,711	108,130
1913.....	3,590	4,500	1932.....	9,891	86,034
1914.....	50	1,000	1933.....	8,243	61,067
1915.....	380	6,400	1934.....	9,951	54,748
1916.....	1,246	18,092	1935.....	14,890	87,055
1917.....	525	5,295	1936.....	17,132	143,709
1918.....	2,114	28,669	1937.....	10,392	79,005
1919.....	2,388	43,657	1938.....	18,783	105,207
1920.....	1,537	25,890	1939.....	41,109	159,951
1921.....	406	6,310	1940.....	35,162	126,516
1922.....	613	4,248	1941.....	85,309	283,663
1923.....	2,936	16,309	1942.....	55,603	209,539
1924.....	4,919	33,404	1943.....	21,154	142,665
1925.....	5,319	32,937	1944.....	34,525	272,064
1926.....	7,170	48,350			
1927.....	13,779	168,896	Totals.....	444,813	\$2,676,335

#### PYRITES

*Bibliography:* State Mineralogist Reports XVIII, XIX, XXII, XXV, XXVI, XXX, XXXV. Bulletins 38, 91. Min. and Sci. Press, Vol. 144, pp. 825, 840.

Pyrite, shipped in California during 1944, came from a single property in Shasta County and showed an increase in amount and value over that of 1943. The annual details are placed under 'Unapportioned' to conceal the output of the individual operator.

This material was mostly used in the manufacture of sulphuric acid for explosives and fertilizer. Some iron sulphate had been produced previously and was utilized directly in the preparation of an agricultural fertilizer and insecticide. The sulphur content ranged up to 50.8% S.

This does not include the large quantities of pyrite, chalcopyrite, and other sulphides which are otherwise treated for their valuable metal contents. Some sulphuric acid is annually made as a by-product in the course of roasting certain tonnages of Mother Lode auriferous concentrates while under treatment for their precious metal values.

#### Pyrites Production in California, by Years

The total recorded pyrites production in California to date is as follows:

Year	Tons	Value	Year	Tons	Value
1898	6,000	\$30,000	1923	148,004	\$555,308
1899	5,400	28,620	1924	124,214	517,835
1900	3,642	21,133	1925	129,500	528,550
1901	4,578	18,429	1926	100,896	466,088
1902	17,525	60,306	1927	130,910	564,823
1903	24,311	94,000	1928	90,566	400,627
1904	15,043	62,992	1929	79,169	363,717
1905	15,503	63,958	1930	39,958	194,228
1906	46,689	145,895	1931	25,402	131,174
1907	82,270	251,774	1932		
1908	107,081	610,335	1933	72,271	297,832
1909	457,867	1,389,802	1934		
1910	42,621	179,862	1935	157,129	547,754
1911	54,225	182,954	1936		
1912	69,872	203,470	1937	155,107	541,915
1913	79,000	218,537	1937		
1914	79,267	230,058	1939	127,604	452,901
1915	92,462	293,148	1940		
1916	120,525	372,969	1941	167,711	598,870
1917	111,325	323,704	1942		
1918	128,329	425,012	1943	234,596	1,001,966
1919	147,024	540,300	1944	*	*
1920	146,001	530,581			
1921	110,025	473,735	Totals	3,900,003	\$14,485,587
1922	151,381	570,425			

\* Annual details concealed under 'Unapportioned.'

### SHALE OIL

*Bibliography:* State Mineralogist Report XIX. U. S. Geol. Surv., Bulletins 322, 729. U. S. Bur. of Mines, Bull. 210, Eng. and Min. Jour.-Press, Vol. 118, No. 8, pp. 290-292, Aug. 23, 1924. Chem. & Met. Eng., Vol. 32, No. 6, Feb. 1925. Min. Congress Jour., Dec. 1924.

Two plants on a more or less experimental scale operated for six years in California, with commercial production beginning in a small way in 1922. The product, in part, was sold for utilization as a flotation oil in metallurgical work, and part consumed as fuel at the plants. There has been no production reported since 1927.

#### Shale Oil Production of California, by Years

Year	Barrels	Value
1922		
1923		
1924	4,333	\$44,262
1925		
1926	8,688	55,240
1927		
1928	8,819	9,998
Totals	21,840	\$109,500

\* Annual details concealed under 'Unapportioned.'

### SILICA (Sand and Quartz)

*Bibliography:* State Mineralogist Reports IX, XIV, XV, XVII, XVIII, XX-XXVIII (inc.), XXXI-XXXII (inc.), XXXV-XXXVIII (inc.). Bulletins 38, 67, 91.

The output of silica (quartz and glass sand) in California during 1944 amounted to 274,291 net tons, valued at \$830,311 f.o.b. rail shipping point, and came from three properties in San Bernardino County;

and one each in Contra Costa, Mariposa, Monterey, and Riverside counties. The above figures were the largest annual output of silica ever reported in this State. The 1943 shipments totaled 161,318 tons, worth \$533,434.

Of the 1944 production, 41,796 tons, worth \$146,582, was quartz, and/or ganister and came from properties in Mariposa, and San Bernardino counties; the remaining 232,495 tons, worth \$683,729, was glass and silica sand and came from Contra Costa, Monterey, Riverside, and San Bernardino counties.

These materials were combined because of an overlapping in their uses and specifications as to the silicon dioxide ( $\text{SiO}_2$ ) content. Vein quartz, ganister, and silica sand are used as refractories, in fire brick, in ceramic mixes and glazes, and as abrasives. It is possible to use quartz as well as glass sand in the manufacture of glass; also some of the quartz was used in the manufacture of ferrosilicon.

Not included under this heading are such forms of silica as sandstone, flint, tripoli, diatomaceous earth, and the gem forms of 'rock crystal,' amethyst, and opal. Each of these has various industrial uses, which are treated under their own designations.

We combine these materials because of the overlapping roles of vein quartz which is mined for use in glass-making and as an abrasive, and that of silica sand which, although mainly utilized in glass manufacture, also serves as an abrasive. Both varieties are also utilized to some extent in fire-brick manufacture.

We do not include under this heading such forms of silica as quartzite, sandstone, flint, tripoli, diatomaceous earth, nor the gem forms of 'rock crystal,' amethyst, and opal. Each of these has various industrial uses, which are treated under their own designations.

There are various deposits of quartz in California which could be utilized for glass making, but to date they have not been so used owing to the cost of grinding and the difficulty of preventing contamination by iron while grinding.

Silica sand has been produced in the following counties of the State: Alameda, Amador, Contra Costa, El Dorado, Imperial, Inyo, Los Angeles, Mariposa, Mono, Monterey, Orange, Placer, Riverside, San Diego, San Joaquin and Tulare, the chief centers being Contra Costa, Amador, Monterey and Los Angeles counties. The industry is of limited importance, so far, because of the fact that much of the available material is not of a grade which will produce first-class colorless glass; for such, it must be essentially iron-free. Even a fractional percent of iron imparts a green color to the glass.

#### **Total Silica Production in California**

Total silica production in California since the inception of the industry, in 1899, is shown below, being mainly sand:

Year	Tons	Value	Year	Tons	Value
1899	3,000	\$3,500	1923	7,964	\$30,420
1900	2,200	2,200	1924	6,808	35,006
1901	5,000	16,250	1925	12,498	96,780
1902	4,500	12,225	1926	30,010	104,317
1903	7,725	7,525	1927	24,636	94,762
1904	10,004	12,276	1928	14,814	66,679
1905	9,257	8,121	1929	18,686	79,210
1906	9,750	13,375	1930	17,802	71,380
1907	11,065	8,178	1931	43,330	182,769
1908	9,255	22,045	1932	33,997	136,324
1909	12,259	25,517	1933	70,329	266,520
1910	19,224	18,265	1934	70,432	296,643
1911	8,620	8,672	1935	70,835	297,272
1912	13,075	15,404	1936	77,830	310,278
1913	18,618	21,899	1937	84,313	348,987
1914	28,538	22,688	1938	63,167	278,676
1915	28,904	34,322	1939	86,229	349,074
1916	20,880	48,908	1940	101,041	376,723
1917	19,376	41,166	1941	137,660	514,266
1918	23,257	88,930	1942	193,174	692,762
1919	18,659	101,600	1943	161,318	533,434
1920	25,324	96,793	1944	274,291	830,311
1921	10,569	49,179			
1922	9,874	31,016	Totals	1,930,087	\$6,691,647

#### SILLIMANITE-ANDALUSITE-KYANITE GROUP

*Bibliography:* State Mineralogist Reports XX, XXIII, XXIV, XXVII, XXXV-XXXVIII (inc.). Bulletins 67, 91. Dana's Mineralogy. U. S. Geol. Surv., Prof. Paper 110. U. S. Bureau of Mines, Inform. Circ. 6255. Eng. & Min. Jour.-Press. Vol. 120, pp. 91-94, 1925. Amer. Mineralogist, June, 1924.

During 1944 in California shipments of andalusite from Mono County and kyanite from Imperial County were made, the annual details being concealed under 'Unapportioned' item so as not to reveal the output of either operator. The 1944 output was a decrease in both amount and value as compared with that of 1943.

Sillimanite and andalusite are both aluminum silicates ( $\text{Al}_2\text{SiO}_5$ ), having the same composition and formula, but with slightly different physical characteristics. Though both crystallize in the orthorhombic system, their crystal habits are different. A massive deposit of andalusite, found in Dry Creek Canyon in the White Mountains of the Inyo Range, in Mono County, is being mined by the Champion Spark Plug Company of Detroit, Michigan. The material is shipped East and utilized in the manufacture of porcelain for automobile spark plugs, for other high-tension electric insulators, laboratory ware and porcelain. Porcelain made from these minerals can be subjected to sudden and extreme changes in temperature without damage.

Kyanite is also an aluminum silicate ( $\text{Al}_2\text{SiO}_5$ ), of the same chemical composition as andalusite and sillimanite, but crystallizing in the triclinic system. A deposit of Kyanite is being mined in Imperial County, near Ogilby, by the Vitrefrax Corporation and shipments made to their refractory plant in Los Angeles.

Dumortierite, though differing somewhat in composition from the above, being a basic aluminum silicate ( $\text{HAl}_3\text{BSi}_3\text{O}_{20}$ ), has proved similar in behavior in ceramic work so that it is now being mixed with andalusite for electrical porcelains. A deposit of this mineral in Nevada is being mined for that purpose. Occurrences of massive dumortierite are known in Imperial and San Diego counties in this State and there may yet be some commercial possibilities for them.



Total Sillimanite Group Production of California, by Years

Year	Tons	Value	Year	Tons	Value
1922}			1933}		
1923}*	4,584	\$98,790	1934}*	3,035	\$69,026
1924}			1935}		
1925}			1936}*	3,112	89,214
1926}*	4,810	203,000	1937}		
1927}			1938}*	2,681	70,477
1928}*	4,276	76,000	1940}		
1929}			1941}*	1,344	23,391
1930}*	4,359	198,893	1942}		
1931}			1943}*	4,046	79,355
1932}*	1,244	21,800	1944}	*	*
			Totals.....	33,491	\$929,946

\* Annual details concealed under 'Unapportioned.'

### SOAPSTONE and TALC

*Bibliography:* State Mineralogist Reports XII, XIV, XV, XVII-XXVII (inc.). XXX, XXXIII-XXXVII (inc.). Bulletins 38, 67, 91. U. S. Bur. of Mines, Bulletin 213. Rep. of Investigations, Serial No. 2253, May, 1921.

The total production of talc, pyrophyllite, and soapstone in California during 1944 amounted to 64,041 net tons, valued at \$824,052; compared with 63,012 tons, worth \$723,056, in 1943. The 1944 output was the largest annual production ever reported in this State and was 63,796 net tons of high grade talc and pyrophyllite. The talc came from five properties each in Inyo and San Bernardino counties and the pyrophyllite from a single property in Mono County. The production of 272 tons of soapstone came from a single property each in Amador and Tuolumne counties.

The talc and pyrophyllite mined during the year were used in toilet powder, cosmetics, paint, paper, rubber manufacture, as a carrier for insecticides, in delousing powder, in cotton finishing, in ceramics, steatite products, etc. The 'soapstone' grades were used in metal workers crayons as a carrier for insecticides.

### Composition and Varieties

Talc is hydrous magnesium silicate with the chemical formula  $\text{H}_2\text{Mg}_3(\text{SiO}_3)_4$ . It is also called soapstone and steatite. The term 'talc' properly includes all forms of the pure mineral, whereas 'steatite' denotes particularly the massive, compact variety, and 'soapstone' the impure, massive forms containing as low as 50% of talc. When pure, talc is soft, having a hardness of 1, but impurities increase the hardness up to 3 or 4. The color varies from pure white and silvery white through gray, green, apple green, to dark green, also yellow, brown, and reddish when impure. It is commonly compact or massive, or in fine granular aggregates, and often in foliated plates or in fibrous aggregates.

Pyrophyllite a hydrous aluminium silicate with the chemical formula  $\text{H}_2\text{Al}_2\text{Si}_4\text{O}_{12}$ . Its physical properties are similar to talc and it is often impossible to tell the two minerals apart. Pyrophyllite is slightly harder than talc.

### Uses

Although the uses of talc and soapstone are many and varied, some of them are not in general well known nor fully developed; and

although few of their uses can justly be considered essential in the sense that no substitute can be used, there are several which are of great importance. The widest use of talc is in the powdered form, and the value depends upon color (whiteness), uniformity, fineness of grain, freedom from grit, 'slip,' and sometimes freedom from lime. The white varieties, free from grit and iron, low in lime, ground to 200-mesh and finer, are largely used as a filler for paper, rubber and paint, and the very highest grade as toilet powder. Ground talc is also used in dressing and coating cloth, in making soap, rope, twine, pipe-covering compounds, heavy lubricants, and polishes, and as a filler in concrete to make it waterproof. Ground talc and soapstone are used in ceramic body for tile and china; for foundry facings, either alone or mixed with graphite and a coarser grade is used in the manufacture of asphalt-coated roofing felts and papers, both as a filler and as a surfacing. Massive close-grained talc, free from iron and grit, is cut into blanks and baked, forming the material used for gas tips and electrical insulation, commonly known as 'lava.' Its hardness, its resistance to heat, acid and alkalies, and its great dielectric strength make it very useful for electric insulation, and no satisfactory substitute for it has been found.

Massive varieties of talc, pyrophyllite, and high grades of soapstone are cut into slate pencils and steel-workers' crayons. 'French chalk' or 'tailor's chalk' is a soft, massive talc. In China, Japan and India, massive talc (steatite) is carved into images and other forms, and is often sold as imitation jade. Soapstone is cut into slabs of 1 and 2 inches in thickness and sold as griddles, footwarmers, and fireless-cooker stones, or fabricated into laundry sinks and tubs, laboratory table tops, hoods, tanks and sinks, electric switchboards, and for other uses in which the properties of resistance to heat, acids and alkalies, and electricity are essential.

#### Talc Production of California, by Years

Production was intermittent in the State up to 1912; but there has been a material growth since 1916, as shown in the following table:

Year	Tons	Value	Year	Tons	Value
1893.....	400	\$17,750	1920.....	11,327	\$221,362
1894.....			1921.....	8,752	130,078
1895.....	25	375	1922.....	13,378	197,186
1896.....			1923.....	17,439	252,661
1897.....			1924.....	16,179	242,770
1898.....			1925.....	15,465	239,084
1899.....			1926.....	17,004	255,645
1900.....			1927.....	16,218	164,744
1901.....	10	119	1928.....	18,668	251,372
1902.....	14	288	1929.....	18,676	193,493
1903.....	219	10,124	1930.....	15,861	154,258
1904.....	228	2,315	1931.....	13,472	109,940
1905.....	300	3,000	1932.....	10,690	122,880
1906.....			1933.....	14,451	153,668
1907.....			1934.....	13,920	158,606
1908.....	3	48	1935.....	17,332	170,830
1909.....	33	280	1936.....	25,643	309,287
1910.....	740	7,260	1937.....	29,657	347,772
1911.....			1938.....	28,346	290,810
1912.....	1,750	7,350	1939.....	31,820	372,078
1913.....	1,350	6,150	1940.....	37,433	329,425
1914.....	1,000	4,500	1941.....	47,935	525,396
1915.....	1,663	14,750	1942.....	47,782	545,509
1916.....	1,703	9,831	1943.....	63,012	723,056
1917.....	5,267	45,279	1944.....	64,041	824,052
1918.....	11,760	85,534			
1919.....	8,764	115,091	Totals.....	649,730	\$7,715,006

## STRONTIUM

*Bibliography:* State Mineralogist Report XXVI, XXVII, XXXV-XXXVI, XXXVIII. Bulletins 67, 91. U. S. G. S. Bull. 540; 660-I.

During 1944 strontium minerals were mined and shipped from one property each in Imperial and San Bernardino counties. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of the individual. The 1943-1944 output totaled 2,500 short tons valued at \$42,406. This material was reported to be used for pyrotechnics (red flares), in the refining of sugar, and in a new alloy of steel. The 1944 output showed a decrease in amount and value from that of 1943.

The first recorded commercial output of strontium minerals in California was in 1916. Shipments reported as averaging 80%  $\text{SrCO}_3$  have been made, and both celestite ( $\text{SrSO}_4$ ) the strontium sulphate and strontianite ( $\text{SrCO}_3$ ) the strontium carbonate have been produced commercially in this State. The deposit is associated with deposits of barite near Barstow, San Bernardino County. The carbonate has also been found in massive form near Shoshone, Inyo County. In addition to Imperial County, celestite is found near Calico and Ludlow, and in the Avawatz Mountains in San Bernardino County, but as yet undeveloped.

The principal use for strontium in the United States is in the form of the nitrate in the manufacture of red flares, or Costen and Bengal lights and fireworks.

Production of strontium minerals in California, by years, has been as follows:

Year	Tons	Value	Year	Tons	Value
1916	57	\$2,850	1940	627	\$8,686
1917	3,050	37,000	1941		
1918	2,900	33,000	1942*	5,671	83,069
1919			1943*	2,500	42,406
1939	2	82	1944		
			Totals	14,807	\$207,093

\* Annual details concealed under 'Unapportioned.'

## SULPHUR

*Bibliography:* State Mineralogist Reports IV, XIII, XIV, XXV, XXXIV, XXXV, XXXVIII. Bulletins 38, 67, 91.

During 1944 there were no shipments of sulphur in California. In 1942 there was one shipper of sulphur from a single property in Inyo County. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of an individual. This mineral has been found to some extent in Alpine, Colusa, Imperial, Inyo, Kern, Lake, Sonoma, Tehama, and Ventura counties.

## Total Production of Sulphur in California

Sulphur was produced at the famous Sulphur Bank mine in Lake County, during the years 1865-1868 (inc.); following which the property

became more valuable for its quicksilver. The Elgin quicksilver mine, near Wilbur Springs, Colusa County, is a similar occurrence.

Production of sulphur in California to date:

Year	Tons	Value	Year	Tons	Value
1865)	941	\$53,500	1934	4,412	\$67,656
1866)*-----			1935)		
1867)			1936)		
1868 to 1922-----	185	4,071	1937)	9,451	120,010
1923)			1938)*-----		
1924)*-----			1939	8,803	105,619
1925 to 1928-----	265	9,025	1940		
1929)			1941		
1930)*-----	1,991	32,838	1942	45,917	\$737,359
1931)			1943		
1932)			Totals-----		
1933)*-----					

\* Annual details concealed under 'Unapportioned.'

### ZIRCON

#### *Bibliography:* State Mineralogist Report XXXIV.

During 1944 there was no production of zircon reported in California but in 1941 there was a small shipment of zircon sand from near Lincoln, Placer County, to the East Coast to be used in a steel alloy. In 1937 for the first time, zircon was reported in commercial quantities, in this State, from the Kaufeld dragline dredge near Lincoln. They recovered considerable zircon from their black sand, but only shipped a small amount for experimental purposes in the manufacture of refractories and as an abrasive in blast sand.

The chief source of zirconium is the mineral zircon, a zirconium silicate,  $ZrSiO_4$ . Zircon is used, as a gem, being next to the diamond in brilliancy; as a refractory, molds for steel, insulation in electric heating devices, as a coating on other refractories, coating of welding rods, and in the manufacture of other zirconium compounds.

The metal zirconium is used in radio tubes as an alloy in steel, with copper, etc.

## CHAPTER SIX

## SALINES

*Bibliography:* State Mineralogist Reports III, XIV, XV, XVII-XXIX (inc.), XXXIII-XXXVIII (inc.). Bulletin 24. Spurr and Wormser, "Marketing of Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

Under this heading are included borax, common salt, soda, potash, and other alkaline salts. The first two have been produced in a number of localities in California, more or less regularly since the early sixties. Except for a single year's absence, soda has had a continuous production since 1894. Potash, magnesium chloride and sulphate, and calcium chloride have been added to the commercial list in recent years, joined in 1926 by bromine, and in 1931 by iodine and in 1938 by the alum minerals.

Our main resources of salines are the lake beds of the desert regions of Imperial, Inyo, Kern, Los Angeles, San Bernardino, and San Luis Obispo counties, and the waters of the Pacific Ocean.

The saline group showed an increase in total value from \$15,660,400 in 1943 to \$20,983,104 in 1944, with all substances included under this heading showing an increased output with the exception of calcium chloride and iodine. A portion of the material included under the heading of magnesia and other magnesium compounds was produced prior to 1944.

The following table gives details for each year:

Substance	1943		1944		Increase + Decrease— Value
	Amount	Value	Amount	Value	
Borates.....	216,687 tons	\$4,953,174	234,860 tons	\$5,264,864	\$311,690+
Magnesia and other magnesium compounds.....	9,026 tons	728,065	113,927 tons	4,537,381	3,809,316+
Salt.....	631,776 tons	1,695,231	769,873 tons	2,060,960	365,729+
Soda (soda ash and salt cake).....	260,590 tons	3,166,576	299,574 tons	3,647,630	481,054+
Unapportioned*.....	-----	5,117,354	-----	5,472,269	354,915+
Total values.....	-----	\$15,660,400	-----	\$20,983,104	
Net increase.....	-----	-----	-----	-----	\$5,322,704

\* Includes bromine, calcium chloride, iodine, and potash.

## ALUM MINERALS

*Bibliography:* State Mineralogist Reports XXXV, XXXVII.

There are several minerals found in California that are considered natural alums. They are hydrous aluminum sulphates combined with sulphates of iron, potassium, sodium or magnesium. The most important are: Alunite,  $K_2Al_6(OH)_{12}(SO_4)_4$ , a basic hydrous aluminum and potassium sulphate, and Alunogen,  $Al_2(SO_4)_3 \cdot 16H_2O$ , an hydrous aluminum sulphate.

In 1938 a small production and some development work was done on an alunogen deposit near Corona, Riverside County. This output

was the first recorded commercial production reported in California. The annual details are combined under 'Unapportioned' item to conceal the output of the single operator. An alunite deposit near Glen Ellen, Sonoma County, was opened up several years ago and some development work has been done in hopes of commercializing this mineral.

### BORATES

*Bibliography:* State Mineralogist Reports III, X, XII-XV (inc.), XVII-XXIII (inc.), XXV-XXVII (inc.), XXXIII-XXXIV, XXXVI, XXXVII. Bulletins 24, 67, 91.

During the year, there was produced in California a total of 276,398 net tons of borate material, as compared with 249,523 tons for the preceding year. The material shipped during the year included the sodium borates, kernite (rasorite), kramerite from Kern County; also crystallized borax prepared by evaporation of brines at Searles Lake in San Bernardino County and Owens Lake in Inyo County, and a small amount of colemanite from Death Valley, Inyo County.

As the crude ore is not sold as such but is almost entirely refined into borax of commerce before shipping, and because of the fact that the material varied widely in boric acid content, we have recalculated the tonnage to a basis of 40 per cent A.B.A. This is approximately the average A.B.A. content of colemanite material after calcining, and also of the crystallized borax obtained from evaporation of the lake brines.

Recalculated, the 1944 output totaled 234,860 net tons, valued at \$5,264,864, as compared with 216,687 tons worth \$4,953,174 for the year 1943. The above came from two properties each in Inyo and San Bernardino counties, and one in Kern County.

### Total Production of Borate Materials in California

Borax was first discovered in California in the waters of Tuscan Springs in Tehama County, January 8, 1856. Borax Lake in Lake County was discovered in September of the same year by Dr. John A. Veach. This deposit was worked in 1864-1868, inclusive, and during that time produced 1,181,365 pounds of refined borax. The bulk of it was exported by sea to New York. This was the first commercial output of this salt in the United States, and California is still today the leading American producer of borax, having been for many years the sole producer. California is also the premier world source, today.

Production from the dry lake 'playa' deposits of Inyo and San Bernardino counties began in 1873; but it was not until 1887 that the borax industry was revolutionized by the discovery of the colemanite beds at Calico, in San Bernardino County and later similar beds in Inyo and Los Angeles counties. The colemanite deposits of Ventura County were not worked extensively, owing to lack of transportation facilities. Some production of colemanite has been made from deposits opened up in Clarke County, Nevada. Colemanite was in turn, displaced by the discovery in 1926 of kernite (rasorite) a sodium borate and probertite (kramerite) a hydrous sodium, and calcium borate, near Kramer in Kern County. The brines of Searles Lake are likewise an important source.

The total production of borate materials in California is shown in the following table:

Total Production of Borate Materials in California

Year	Tons	Value	Year	Tons	Value
1864	12	\$9,478	1905	46,334	\$1,019,158
1865	126	94,099	1906	58,173	1,182,410
1866	201	132,538	1907	53,413	1,200,913
1867	220	156,137	1908	22,200	1,117,000
1868	32	22,384	1909	16,628	1,163,960
1869			1910	16,828	1,177,960
1870			1911	50,945	1,456,672
1871			1912	42,135	1,122,713
1872	140	89,600	1913	58,051	1,491,530
1873	515	255,440	1914	62,500	1,483,500
1874	915	259,427	1915	67,004	1,663,521
1875	1,168	289,080	1916	103,523	2,409,375
1876	1,437	312,537	1917	109,944	2,561,958
1877	993	193,705	1918	88,772	1,867,908
1878	373	66,257	1919	66,791	1,717,192
1879	364	65,443	1920	127,065	2,794,206
1880	609	149,245	1921	50,136	1,096,326
1881	690	189,750	1922	39,087	1,068,025
1882	732	201,300	1923	62,667	1,893,798
1883	900	265,500	1924	52,070	1,599,149
1884	1,019	198,705	1925	46,124	1,526,938
1885	942	155,430	1926	47,605	1,625,298
1886	1,285	173,475	1927	72,462	3,043,260
1887	1,015	116,689	1928	109,722	3,378,552
1888	1,405	196,636	1929	144,678	3,312,035
1889	965	145,473	1930	209,869	3,686,817
1890	3,201	480,152	1931	206,405	5,753,037
1891	4,267	640,000	1932	179,356	2,856,470
1892	5,525	838,787	1933	197,495	3,019,513
1893	3,955	593,292	1934	240,696	5,524,262
1894	5,770	807,807	1935	280,249	4,602,064
1895	5,959	595,900	1936	313,389	5,911,093
1896	6,754	675,400	1937	326,099	6,206,619
1897	8,000	1,080,000	1938	276,144	5,014,237
1898	8,300	1,153,000	1939	244,819	5,110,807
1899	20,357	1,139,882	1940	212,358	5,254,154
1900	25,837	1,013,251	1941	224,986	4,745,872
1901	22,221	982,380	1942	203,716	4,929,553
1902	17,202	2,234,994	1943	216,687	4,953,174
1903	34,430	661,400	1944	234,860	5,264,864
1904	45,647	698,810			
			Totals	5,415,468	\$134,139,326

<sup>1</sup> Refined borax.

<sup>2</sup> Recalculated to 40% 'anhydrous boric acid' equivalent beginning with 1922.

## BROMINE

### *Bibliography:* State Mineralogist Report XXXVII.

The first commercial production of bromine and bromine compounds was begun during 1926 by the California Chemical Corporation in its plant at Chula Vista, San Diego County, from salt-works bittern waters. This same plant has been recovering magnesium chloride for a number of years. Bromine is also now being made at a similar bittern-water plant at Newark, Alameda County, and beginning in 1940 from brines at Searles Lake, San Bernardino County. The 1944 output is an increase in amount and value as compared with that of 1943. The 1944 yield was the largest annual production on record in California; annual details of which are concealed under the 'Unapportioned' item so as not to reveal the production of the single company which operated two of the two plants.

The total commercial production of bromine in California is as follows:

Year	Tons	Value	Year	Tons	Value
1926			1937		
1927 } *	158	\$120,480	1938 } *	914	\$327,823
1928			1939		
1929			1940	1,579	528,245
1930 } *	802	552,933	1941		
1931			1942 } *	2,206	741,790
1932			1943 } *	2,762	1,024,549
1933 } *	559	146,547	1944		
1934			Totals	9,785	\$3,633,832
1935					
1936 } *	805	191,465			

\* Annual details concealed under 'Unapportioned.'

### CALCIUM CHLORIDE

*Bibliography:* State Mineralogist Report XXXVII U. S. Geol. Surv. Min. Res. 1919, Pt. II. Engineering and Contracting, Roads and Streets, monthly issue, Feb. 6, 1924. 'How to Maintain Roads,' manual of instruction of Dow Chemical Company.

Calcium chloride is hygroscopic, that is, it has an affinity for water. This property is taken advantage of by utilizing this salt as a drying agent.

During 1944 the production of calcium chloride in California came from one property each in Imperial and San Bernardino counties. The annual details are combined under the 'Unapportioned' item to conceal the output of the operators. The 1944 output showed a decrease in both amount and value as compared with that of 1943.

#### Total Calcium Chloride Production in California

Commercial production of calcium chloride in California was first reported to the State Mining Bureau in 1921, from two plants in San Bernardino County, being obtained as a by-product in the refining of salt from deposits in certain of the desert dry lakes. Total production in California is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1921	683	\$22,980	1934		
1922			1935 } *	4,048	\$16,196
1923 } *	1,204	26,580	1936 } *	7,227	35,073
1924			1937 } *		
1925 } *	10,988	328,876	1938 } *	7,279	40,182
1926			1939 } *		
1927 } *	34,195	508,748	1940		
1928			1941 } *	7,134	28,856
1929 } *	12,020	114,080	1942		
1930			1943 } *	14,448	61,027
1931 } *	9,688	103,237	1944		
1932			Totals	112,017	\$1,301,353
1933 } *	3,103	15,500			

\* Annual details concealed under 'Unapportioned.'

### IODINE

*Bibliography:* State Mineralogist Reports XXXIV, XXXVI-XXXVII. U. S. Bureau of Mines I. C. 6387.

In 1944 the output of iodine in California came from two plants in Los Angeles County and showed a decrease in value as compared



with that of 1943. The annual details for 1944 are combined under the 'Unapportioned' item to conceal the output of either operator. The 1943 production was the largest in amount and value so far reported in this State. The combined 1943-1944 output totaled 1,194,388 pounds valued at \$1,532,70.

#### Total Iodine Production in California

Iodine was first produced in California during 1917 to 1921 as a by-product of potash which was reduced from kelp in an experimental station of U. S. Department of Agriculture at Summerland, but after the armistice the demand for these minerals decreased so that the plant in Santa Barbara County closed. In 1929 the General Salt Company erected a plant which reduces iodine from the waste waters of certain deep oil wells in the Long Beach field. During 1933 two more plants started operation, making a total of three producing plants in the State.

Year	Pounds	Value
1929 } 1931 } * 1933 } -----	696,297	\$1,374,311
1934 } ----- 1935 } -----	355,279	423,016
1936 } * 1937 } ----- 1938 } * 1939 } -----	487,401	379,702
1940 } * 1941 } ----- 1942 } * 1943 } * 1944 } -----	624,318	508,119
	795,510	862,931
	979,733	1,207,613
	1,194,388	1,532,700
Totals -----	5,132,926	\$6,261,238

\* Annual details concealed under 'Unapportioned.'

#### MAGNESIA and other MAGNESIUM COMPOUNDS

*Bibliography:* State Mineralogist Reports XX, XXI, XXV-XXVI (inc.), XXXIV, XXXVII. Bulletin 91. 'Dictionary of Applied Chemistry,' by Thorpe. U. S. Geol. Surv., Min. Res. of P. S.

Magnesia and magnesium compounds produced in California during 1944 came from two properties in San Mateo County and one each in Alameda, Monterey, and San Diego counties. The 1944 total was 113,927 net tons worth \$4,537,381, but included some material produced prior to 1944 but not previously reported. The material from Alameda County was basic magnesium carbonate and magnesium hydroxide; that from Monterey County was magnesia and periclase; that from San Diego County was magnesium chloride; and that from San Mateo County was basic magnesium carbonate, magnesium carbonate, magnesium hydroxide, and magnesium oxide. Also coming from Alameda County was a tonnage of magnesium hydroxide but not included in the above totals as this material was used as magnesite and therefore is included herein under that substance. The 1944 output was the largest annual production in both amount and value thus far reported in this State. The chloride was nearly all sold for use in magnesite stucco and cement mixtures (Sorel cement) also some for road liquor. The carbonate, or bulky white powder, was used as a heat-insulating material, as a substi-

tute for magnesite, as a filler for rubber, paper, paint, etc., and in medicines, in tooth paste, in face powder and as a polish for metal and glass. The sulphate market as in past years was utilized for medicinal and bath purposes. The material coming from San Diego County was residual bitterns from the salt plants and was in part marketed in the liquid form carrying from 35% to 67%  $MgCl_2$  and in part as dry crystals, while that from Alameda and San Mateo counties was magnesium carbonate, magnesium hydroxide, and magnesium oxide, obtained by precipitation from sea water.

#### Total Production of Magnesium Salts in California

Commercial production of magnesium chloride in California was begun in 1916 by some of the salt companies, from the residual bitterns obtained during the evaporation of sea water for its sodium chloride. In addition, some magnesium sulphate, or 'epsom salts' has also been made, but in smaller amount, and magnesium carbonate by a patented process, direct from sea water.

The total production of magnesium salts in California, since the beginning of the industry here, is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1916.....	851	\$6,407	1933.....	2,073	\$159,660
1917.....	1,064	34,973	1934.....	2,325	194,642
1918.....	1,008	29,955	1935.....	2,785	235,531
1919.....	1,616	82,457	1936.....	3,798	347,838
1920.....	3,150	107,787	1937.....	3,867	316,669
1921.....	4,153	106,140	1938.....	24,176	469,636
1922.....	3,036	89,788	1939.....	3,895	382,457
1923.....	3,662	116,031	1940.....	4,325	419,666
1924.....	4,823	145,883	1941.....	6,352	654,372
1925.....	4,221	132,553	1942.....	6,260	642,680
1926.....	4,881	124,470	1943.....	9,026	728,065
1927.....			1944.....	113,927	4,537,381
1928)*.....	6,241	139,589			
1929.....			Totals.....	229,178	\$10,756,515
1930)*.....	4,914	333,906			
1931.....					
1932)*.....	2,749	217,979			

\* Annual details concealed under 'Unapportioned.'

#### POTASH

*Bibliography:* State Mineralogist Reports XV, XVIII, XX, XXII, XXV-XXXVII (inc.), XXXIV, XXXVII. Bulletins 24, 67, 91. U. S. G. S., Min. Res. 1913, 1914, 1915. Senate Doc. No. 190, 62 Congress, 2d Session. Mining & Sci. Press, Vol. 112, p. 155; Vol. 114, p. 789. Eng. & Min. Jour.-Press, Vol. 117, p. 557, Apr. 5, 1924.

The 1944 production of potash in California came from a single operator in San Bernardino County, the details of which are concealed under the 'Unapportioned' item. This was principally chloride and some sulphate, with the product averaging 60% equivalent  $K_2O$  content. The material was sold mainly for fertilizer manufacture. The 1944 output showed an increase in amount and value over that of 1943.

**Total Production of Potash in California**

Potash production began commercially in California in 1914, with a small yield from kelp. Practically all of the output now comes from deposits of potash-bearing residues and brines in the old lake beds of the desert regions, particularly Searles Lake, San Bernardino County. A small amount has been made from salt-works bitterns, and for a time there was some from Portland cement dust. Some also has been obtained from molasses distillery-slops char.

The annual amounts and values of these potash materials, since their beginning in California in 1914, have been as follows:

Year	Tons	Value	Year	Tons	Value
1914.....	10	\$460	1932)		
1915.....	1,076	19,391	1933/*.....	153,147	\$3,932,721
1916.....	17,808	663,605	1934)		
1917.....	129,022	4,202,889	1935/*.....	355,604	3,750,809
1918.....	49,381	6,808,976	1936)		
1919.....	28,118	2,415,963	1937/*.....	358,417	6,988,922
1920.....	26,298	1,465,463	1938)		
1921.....	14,806	390,210	1939/*.....	383,981	9,057,866
1922.....	17,776	584,388	1940)		
1923.....	29,597	709,836	1941/*.....	310,023	6,058,274
1924.....	33,107	747,407	1942)		
1925.....	36,355	\$29,770	1943/*.....	375,542	7,647,355
1926.....	32,884	\$12,285	1944)	*	*
1927.....	67,340	1,952,852			
1928)			Totals.....	2,671,335	\$69,067,308
1929/*.....	178,680	5,522,350			
1930)					
1931/*.....	172,263	5,500,536			

\* Annual details concealed under 'Unapportioned.'

**SALT**

*Bibliography:* State Mineralogist Reports II, XII-XV (inc.), XVII-XXIII (inc.), XXV-XXVII (inc.), XXXIV-XXXVIII (inc.). Bulletins 24, 67, 91. U. S. Geol. Survey, Bull. 669. U. S. Bur. of Mines, Bull. 146.

Most of the salt production in California is obtained by evaporation of water of the Pacific Ocean, plants being located on the shores of San Francisco, Monterey, and San Diego bays, and at Long Beach. Additional amounts are derived from lakes and lake beds in the desert regions (in part, rock salt), mainly in Imperial, Kern, and San Bernardino counties, and evaporation of alkaline lake water in Modoc County. A small amount of valuable medicinal salts has been obtained by evaporation of the water of Lake Mono, Mono County, and from a mineral spring in Butte County.

The 1944 salt production in California totaled 769,873 net tons, valued at \$2,060,960, and came from three properties in Alameda County; two in San Bernardino County; and one each in Imperial, Kern, Los Angeles, Monterey, Orange, and San Diego counties. The 1944 salt output was the largest annual yield ever reported in this State. The figures for 1943 were 631,776 tons worth \$1,695,231. The average value reported by salt producers in California in 1944 was \$2.68 per net ton, f.o.b. plant compared with \$2.68 in 1943; \$2.90 in 1942; \$2.72 in 1941; \$2.79 in 1940; \$2.75 in 1939; \$2.78 in 1938; and \$2.82 in 1937.

## Production of Salt in California, by Years

Although salt has been made in California since the early '60's, there are no definite or authenticated records for the earlier years before the beginning of the statistical tabulations by the State Mining Bureau.

Amount and value of annual production of salt in California from 1887 is shown in the following tabulation :

Year	Tons	Value	Year	Tons	Value
1887.....	28,000	\$112,000	1917.....	227,825	\$584,373
1888.....	30,800	92,400	1918.....	212,076	806,328
1889.....	21,000	63,000	1919.....	233,994	896,963
1890.....	8,729	57,085	1920.....	230,638	972,648
1891.....	20,094	90,303	1921.....	197,959	832,702
1892.....	23,570	104,788	1922.....	223,238	819,187
1893.....	50,500	213,000	1923.....	275,979	1,130,670
1894.....	49,131	140,087	1924.....	318,800	1,159,137
1895.....	53,031	150,576	1925.....	284,068	949,826
1896.....	64,743	153,244	1926.....	311,761	1,124,978
1897.....	67,851	157,520	1927.....	263,028	639,127
1898.....	93,421	170,855	1928.....	340,580	1,024,656
1899.....	82,654	149,588	1929.....	392,039	2,665,436
1900.....	89,338	204,754	1930.....	347,945	1,167,487
1901.....	126,218	366,376	1931.....	330,951	1,233,567
1902.....	115,208	205,876	1932.....	256,353	918,480
1903.....	102,895	211,365	1933.....	321,312	1,251,024
1904.....	95,968	187,300	1934.....	332,194	1,222,810
1905.....	77,118	141,925	1935.....	365,711	1,230,480
1906.....	101,650	213,228	1936.....	398,249	1,227,505
1907.....	88,063	310,967	1937.....	370,431	1,044,325
1908.....	121,764	281,469	1938.....	395,746	1,099,737
1909.....	155,680	414,708	1939.....	417,956	1,174,386
1910.....	174,920	395,417	1940.....	462,282	1,290,728
1911.....	173,332	324,255	1941.....	434,237	1,180,929
1912.....	185,721	383,370	1942.....	672,324	1,922,991
1913.....	204,407	462,681	1943.....	631,776	1,695,231
1914.....	223,806	583,553	1944.....	769,873	2,060,960
1915.....	169,028	368,737			
1916.....	186,148	455,695	Totals.....	13,003,143	\$40,492,793

## SODA

*Bibliography:* State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XX, XXII, XXIII, XXV-XXIX (inc.), XXXIV, XXXVI-XXXVIII. Bulletins 24, 67, 91. U. S. Geol. Surv., Bull. 717.

The production of sodium salts in California in 1943 included soda ash, and trona, from plants at Owens Lake, Inyo County; and soda ash, salt cake, and trona (sequi-carbonate, a double salt of  $\text{Na}_2\text{CO}_3$  and  $\text{NaHCO}_3$ ) from Searles Lake, San Bernardino County. The plant on Dale Lake near Amboy and Searles Lake, San Bernardino County, started operations during the year 1940 and made shipments of salt cake in 1941. There were no shipments of salt cake (sulphate) from Carrizo Plains, San Luis Obispo County. Shipments made during the year 1944 totaled 299,574 net tons valued at \$3,647,630 as compared with 260,590 tons worth \$3,166,576 in 1943. The 1944 output had the largest amount and value of any annual production ever reported in this State. In 1944 179,621 tons of soda ash and 119,953 tons of salt cake were reported shipped in California.

The soda ash was used mainly in the manufacture of soap, glass, paper, oil refining, sugar refining, and chemicals; and the trona for metallurgical purposes. The salt cake or sodium sulphate was used in the manufacture of paper, glass, and in chemicals.

## Soda Production of California, by Years

The total output, showing amount and value of these materials in California since the inception of the statistical records of the State Mining Bureau, is given in the table which follows:

Year	Tons	Value	Year	Tons	Value
1894.....	1,530	\$20,000	1920.....	32,407	\$1,164,898
1895.....	1,900	47,500	1921.....	14,828	438,996
1896.....	3,000	65,000	1922.....	20,084	573,661
1897.....	5,000	110,000	1923.....	34,885	764,284
1898.....	7,000	154,000	1924.....	32,536	711,796
1899.....	10,000	250,000	1925.....	48,625	947,649
1900.....	1,000	50,000	1926.....	63,333	1,305,802
1901.....	8,000	400,000	1927.....	62,571	1,478,239
1902.....	7,000	50,000	1928.....	80,838	1,469,297
1903.....	18,000	27,000	1929.....	90,646	1,838,657
1904.....	12,000	18,000	1930.....	90,122	1,627,344
1905.....	15,000	22,500	1931.....	78,701	1,217,811
1906.....	12,000	18,000	1932.....	58,017	826,369
1907.....			1933.....	70,598	1,019,130
1908.....	9,600	14,400	1934.....	99,380	1,219,561
1909.....	7,712	11,593	1935.....	125,504	1,341,045
1910.....	8,125	11,862	1936.....	144,314	1,412,788
1911.....	9,023	52,887	1937.....	153,685	1,461,057
1912.....	7,200	37,094	1938.....	178,105	2,023,610
1913.....	1,861	24,936	1939.....	200,049	2,055,608
1914.....	6,522	115,396	1940.....	228,108	2,339,639
1915.....	5,799	83,485	1941.....	179,210	2,028,718
1916.....	10,593	264,825	1942.....	267,723	3,125,078
1917.....	24,505	928,578	1943.....	260,590	3,166,576
1918.....	20,447	855,423	1944.....	299,574	3,647,630
1919.....	21,294	721,958			
			Totals.....	3,248,544	\$43,559,680

## CHAPTER SEVEN

### BY COUNTIES

#### Introductory

The State of California includes a total area of 158,297 square miles, of which 156,803 square miles are of land (according to 1940 census resurvey). The maximum width is 235 miles, the minimum 148 miles, and the length from the northwest corner to the southeast corner is 775 miles. The State is divided into fifty-eight counties. The 1940 census figures show a total population for California of 6,907,387. Minerals of commercial value exist in every county, and during 1944 some active production was reported to the State Division of Mines from all of the fifty-eight.

#### Rank of Counties in Mineral Yield, 1944

Of the ten leading counties in point of total value of mineral output during 1944, the first six, Kern, Los Angeles, Fresno, Orange, Ventura, and Santa Barbara, and Kings eighth, owe their position to petroleum and natural gas; and Sacramento, tenth, to natural gas and miscellaneous stone. Kern County which led all others in 1944 and is credited with 23 per cent of the state's value, passed Los Angeles County for the first time since 1923. Both counties owe their position to crude oil. San Bernardino County, seventh, owes its position to cement, borates, iron ore, potash, and soda; and Alameda County, ninth, to miscellaneous stone and salt.

There were twenty-six counties having a mineral production valued in excess of a million dollars in 1944. The value of natural gas exceeded the million dollar mark in eight counties; cement and petroleum in seven counties each; miscellaneous stone in five counties; borates in two counties; and brick, copper, diatomite, iron ore, magnesia, potash, quick-silver, salt, soda, and tungsten ore in one county each.

In point of variety and diversity San Bernardino County led all others in 1944 with thirty-one different mineral substances on its commercial list; followed in turn by Kern County with twenty; Inyo County, eighteen; Los Angeles, Riverside, and Shasta counties each with thirteen; Calaveras, Fresno, and Orange counties each with twelve; Amador and San Diego counties each with eleven; and Butte, Nevada, and Santa Clara counties each with ten.

## Mineral output by counties in order of value for 1944:

County	Value	County	Value
1. Kern -----	\$108,257,342	31. San Luis Obispo -----	\$704,818
2. Los Angeles -----	108,138,154	32. Nevada -----	619,179
3. Fresno -----	49,800,782	33. Tulare -----	615,630
4. Orange -----	33,312,154	34. Imperial -----	564,263
5. Ventura -----	30,545,897	35. Stanislaus -----	545,376
6. Santa Barbara -----	23,908,079	36. Trinity -----	516,066
7. San Bernardino -----	23,358,596	37. Del Norte -----	509,703
8. Kings -----	13,984,044	38. Lake -----	468,389
9. Alameda -----	8,089,026	39. Tuolumne -----	465,734
10. Sacramento -----	7,832,687	40. Yolo -----	394,299
11. Inyo -----	6,716,413	41. Humboldt -----	373,525
12. Solano -----	5,973,575	42. Marin -----	312,849
13. Santa Clara -----	5,228,668	43. El Dorado -----	298,859
14. Riverside -----	5,203,973	44. Amador -----	283,206
15. Monterey -----	4,942,121	45. Modoc -----	255,229
16. Contra Costa -----	3,244,179	46. Placer -----	250,237
17. Calaveras -----	2,642,638	47. Mendocino -----	152,039
18. Shasta -----	2,615,373	48. Mono -----	123,173
19. Siskiyou -----	2,507,921	49. San Francisco -----	120,000
20. San Mateo -----	2,452,525	50. Sierra -----	114,195
21. San Benito -----	1,985,039	51. Tehama -----	101,823
22. San Diego -----	1,985,032	52. Sutter -----	89,246
23. Santa Cruz -----	1,762,807	53. Plumas -----	78,714
24. San Joaquin -----	1,369,198	54. Madera -----	74,141
25. Mariposa -----	1,306,411	55. Glenn -----	33,736
26. Yuba -----	1,106,311	56. Lassen -----	26,495
27. Butte -----	929,239	57. Colusa -----	14,491
28. Sonoma -----	905,121	58. Alpine -----	2,214
29. Merced -----	853,905		
30. Napa -----	709,686	Total value -----	\$469,774,525

## ALAMEDA

*Land area:* 732 square miles.

*Population:* 513,011 (1940 census).

*Location:* East side of San Francisco Bay.

*County seat:* Oakland.

*References:* State Mineralogist Report XVII:XVIII:XX:XXVI  
(Oct., 1929): XXXV.

Alameda, while in no sense one of the "mining counties," came ninth on the list of counties as to value, with a mineral production for 1944 worth \$8,089,026 and had nine different substances. This was an increase over the 1943 output which was valued at \$5,336,917.

Commercial production for 1944 was as follows:

Substance	Value
Stone, miscellaneous -----	\$6,112,065
Unapportioned* -----	1,976,961
Total value -----	\$8,089,026

\* Includes brick and hollow tile, bromine, clay (pottery), copper, gypsum (reduced from sea water and lime), lime (burnt from shells dredged in Santa Clara County), magnesium salts, manganese ore, salt.

## ALPINE

*Land area:* 776 square miles.

*Population:* 323 (1940 census).

*Location:* On eastern border of State, south of Lake Tahoe.

*County seat:* Markleeville.

*References:* State Mineralogist Report XV:XVII:XVIII:XXVII  
(Oct., 1931): XXV:XXXVII.

Alpine County ranked fifty-eighth in value of output for 1944 which was \$2,214, compared with \$20,241 in 1943. The 1944 production was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	15 fine ozs.	\$525
Silver -----	671 fine ozs.	477
Unapportioned* -----	-----	1,212
Total value -----	-----	\$2,214

\* Includes copper and stone, miscellaneous.

### AMADOR

*Land area:* 601 square miles.

*Population:* 8,973 (1940 census).

*Location:* East-central part of State—Mother Lode District.

*County seat:* Jackson.

*References:* State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXII (April, 1927):XXX:XXXV:XXXVII.

Amador County ranked forty-fourth as to value of mineral output for 1944 with eleven different substances worth \$283,206, compared with \$534,098 in 1943.

Amador at one time led the State in gold production, though exceeded in 1920-1923 and in 1926-1927 by Yuba and Nevada counties; but in 1925 and 1928 by Yuba only, in 1929-1932 by Nevada only, and in 1931-1936 and 1939-1941 by Nevada and Sacramento, and only ranked fifteenth in 1944.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Copper -----	440,962 lbs.	\$59,530
Gold -----	734 fine ozs.	25,690
Lead -----	1,560 lbs.	125
Silver -----	2,173 fine ozs.	1,524
Stone, miscellaneous -----	-----	8,492
Unapportioned* -----	-----	187,845
Total value -----	-----	\$283,206

\* Includes brick, clay (pottery), coal, manganese ore, soapstone.

### BUTTE

*Land area:* 1,722 square miles.

*Population:* 42,840 (1940 census).

*Location:* North-central portion of State.

*County seat:* Oroville.

*References:* State Mineralogist Report XV:XVII:XVIII:XXIV:XXVI (Oct., 1930):XXXI (Jan., 1936).

Butte County ranked twenty-seventh in regard to value of mineral output in 1944 with eleven different substances, having a total value of \$929,239 compared with \$755,968 in 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Copper -----	464,858 lbs.	\$62,756
Gold -----	10,635 fine ozs.	372,225
Lead -----	56,209 lbs.	4,497
Silver -----	11,835	8,416
Stone, miscellaneous -----	-----	135,800
Zinc -----	2,954,519 lbs.	335,789
Unapportioned* -----	-----	9,756
Total value -----	-----	\$929,239

\* Includes cadmium, chromite, mineral water.



## CALAVERAS

*Land area:* 1027 square miles.

*Population:* 8,221 (1940 census).

*Location:* East-central portion of State—Mother Lode District.

*County seat:* San Andreas.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXI:XXXII (July, 1936):XXXV:XXXVII.

Calaveras County ranked seventeenth in California in regard to value of mineral output in 1944, with a total of \$2,642,638, as compared with \$2,831,543 in 1943.

Commercial production for 1944 consisted of twelve different substances, and was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Copper -----	4,952,034 lbs.	\$668,524
Gold -----	1,933 fine ozs.	67,655
Lead -----	191,233 lbs.	15,298
Silver -----	58,018 fine ozs.	41,302
Stone, miscellaneous -----	-----	88,795
Zinc -----	2,172,165 lbs.	247,627
Unapportioned* -----	-----	1,513,437
Total value -----	-----	\$2,642,638

\* Includes cement, chromite, clay (pottery), gems (quartz crystals), mineral water.

## COLUSA

*Land area:* 1140 square miles.

*Population:* 9,788 (1940 census).

*Location:* Sacramento Valley.

*County seat:* Colusa.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXV (April, 1929):XXXV.

Colusa County ranked fifty-seventh in regard to value of mineral output in 1944, with three different mineral substances, worth a total of \$14,491, as compared with \$93,486 in 1943.

Commercial production for 1944 consisted of chromite, manganese ore, and stone (miscellaneous).

## CONTRA COSTA

*Land area:* 714 square miles.

*Population:* 100,450 (1940 census).

*Location:* East side of San Francisco Bay.

*County seat:* Martinez.

*References:* State Mineralogist Report XVII:XVIII:XXIII (Jan., 1927):XXXV.

Contra Costa County stands sixteenth on the list in respect to value of mineral output for 1944, with eight different substances worth \$3,244,179 as compared with \$4,284,821 in 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$942,406
Unapportioned* -----	2,301,773
Total value -----	\$3,244,179

\* Includes brick and hollow tile, cement, mineral water, natural gas, quicksilver, silica (glass sand).

**DEL NORTE**

*Land area:* 1024 square miles.

*Population:* 4,745 (1940 census).

*Location:* Extreme northwest corner of State.

*County seat:* Crescent City.

*References:* State Mineralogist Report XIV : XVII : XXI (July, 1925) :XXIX (Jan.-April, 1933) :XXXIV :XXXV :XXXVII.

Del Norte County was in thirty-seventh place as to mineral production for 1944 with four different substances worth \$509,703, as compared with \$609,664 in 1943.

Commercial production in 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Chromite -----	11,040 long tons	\$491,141
Gold -----	3 fine ozs.	105
Stone, miscellaneous -----	----	17,748
Other minerals -----	----	709
Total value -----		\$509,703

**EL DORADO**

*Land area:* 1753 square miles.

*Population:* 13,229 (1940 census).

*Location:* East-central portion of the State, northernmost of the Mother Lode counties.

*County seat:* Placerville.

*References:* State Mineralogist Report XV :XVII :XVIII :XIX : XX :XXII (Oct., 1926) :XXXI :XXXIV (July, 1938) :XXXV : XXXVIII.

El Dorado, which contains the location where gold in California was first heralded to the world, comes forty-third on the list of counties ranked according to value for 1944, with nine different mineral substances worth \$298,859. In addition to the segregated figures here given, a large tonnage of limestone was formerly shipped for use in cement manufacture, the value being included in the State's total for cement. The 1943 output was valued at \$304,449.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Chromite -----	535 long tons	\$16,776
Copper -----	52,658 lbs.	7,109
Gold -----	82 fine ozs.	2,870
Silver -----	807 fine ozs.	574
Unapportioned* -----	----	271,530
Total value -----		\$298,859

\* Includes limestone, lead, slate, stone, miscellaneous.

**FRESNO**

*Land area:* 5950 square miles.

*Population:* 178,565 (1940 census).

*Location:* South-central portion of State.

*County seat:* Fresno.

*References:* State Mineralogist Report XIV :XVII :XVIII :XXV (July, 1929) :XXXV :XXXVII.

Fresno County, third in importance as a mineral producer among the counties of California, reports an output for 1944 of twelve different mineral substances, with a total value of \$49,800,782, as compared with the 1943 value of \$41,039,427.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	155 fine ozs.	\$5,425
Natural gas -----	32,686,565 M cu. ft.	2,836,676
Petroleum -----	45,325,244 bbls.	46,159,669
Silver -----	18 fine ozs.	13
Stone, miscellaneous -----	-----	431,154
Tungsten ore -----	8,280 units	204,624
Unapportioned* -----	-----	163,221
Total value -----	-----	\$49,800,782

\* Includes brick and hollow tile, chromite, clay (pottery), feldspar, granite.

### GLENN

*Land area:* 1259 square miles.

*Population:* 12,195 (1940 census).

*Location:* West side of Sacramento Valley.

*County seat:* Willows.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXXV:XXXVII.

Glenn County stands fifty-fifth as a mineral producing county of the State for 1944, and owes its position to the presence of large deposits of sand and gravel, much of which is used as railroad ballast, chromite, and natural gas.

Commercial production for 1944 totaled \$33,736 which is a decrease from \$915,030, the 1943 total.

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$30,512
Unapportioned* -----	3,224
Total value -----	\$33,736

\* Includes chromite, manganese ore, natural gas.

### HUMBOLDT

*Land area:* 3634 square miles.

*Population:* 45,812 (1940 census).

*Location:* Northwestern portion of State, bordering on Pacific Ocean.

*County seat:* Eureka.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXI (July, 1925):XXXV:XXXVII (Oct., 1941).

Humboldt County ranked forty-first in the value of its mineral output among the counties of the State for 1944 with nine different mineral substances valued at \$373,525, compared with the 1943 output worth \$237,827.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	23 fine ozs.	\$895
Silver -----	2 fine ozs.	3
Stone, miscellaneous -----	-----	161,157
Unapportioned* -----	-----	211,566
Total value -----	-----	\$373,525

\* Includes brick, chromite, clay (pottery), manganese ore, natural gas.

## IMPERIAL

*Land area:* 4089 square miles.

*Population:* 59,740 (1940 census).

*Location:* Extreme southeast corner of the State.

*County seat:* El Centro.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXII (April, 1926):XXXIV-XXXVI (inc.), XXXVIII (April, 1942).

Imperial County ranks thirty-fourth in total value of mineral output for 1944, with nine different mineral substances, worth \$564,263, compared with \$685,203 for 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$89,690
Unapportioned* -----	474,573
Total value -----	\$564,263

\* Includes calcium chloride, carbon dioxide, gypsum, manganese ore, mica schist, salt, kyanite, strontium.

## INYO

*Land area:* 10,019 square miles.

*Population:* 7625 (1940 census).

*Location:* Lies on eastern border of State, north of San Bernardino County.

*County seat:* Independence.

*References:* State Mineralogist Report XV : XVII : XVIII : XX : XXII (Oct., 1926) : XXVII : XXX : XXXIII : XXXIV (Oct., 1938) : XXXV-XXXVII (inc.).

Inyo County's mineral output for 1944 reached a total value of \$6,716,413, having eighteen different mineral substances and standing eleventh among the counties of the State as to value of production. The 1943 yield was worth \$8,025,406.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Bentonite -----	1,851 tons	\$24,910
Copper -----	557,286 lbs.	75,234
Gold -----	2,571 fine ozs.	89,985
Lead -----	10,060,151 lbs.	804,812
Pumice -----	12,956 tons	72,996
Talc -----	24,505 tons	356,108
Silver -----	411,003 fine ozs.	292,269
Stone, miscellaneous -----	-----	11,462
Zinc -----	1,294,165 lbs.	147,535
Unapportioned* -----	-----	4,841,102
Total value -----	-----	\$6,716,413

\* Includes antimony, borates, limestone, marble, molybdenum ore, quicksilver, soda ash, tungsten ore.

## KERN

*Land area:* 8003 square miles.

*Population:* 135,124 (1940 census).

*Location:* South-central portion of State.

*County seat:* Bakersfield.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXV (Jan., 1929):XXIX (July-Oct., 1933):XXX:XXXIV:XXXVII (inc.).

Kern County, because of its immensely productive oil fields, stands preeminent among all counties of California in the value of its mineral output. It was surpassed by Los Angeles and Orange counties in 1923, but by Los Angeles only in 1924-1943, for which petroleum is responsible. The 1944 production consisted of twenty different mineral substances valued at \$108,257,342, compared with the 1943 output worth \$94,245,359. Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Clay (pottery and oil well drilling) -----	152,237 tons	\$522,711
Gypsum -----	292,306 tons	394,356
Gold -----	1,291 fine ozs.	45,185
Lead -----	7,142 lbs.	571
Natural gas -----	72,111,360 M cu. ft.	3,786,075
Petroleum -----	92,694,311 bbls.	98,829,308
Silver -----	1,060 fine ozs.	754
Stone, miscellaneous -----	-----	222,606
Tungsten ore -----	306 units	7,390
Zinc -----	8,532 lbs.	973
Unapportioned* -----	-----	4,447,413
Total value -----	-----	\$108,257,342

\* Includes antimony, bentonite, borates, brick, cement, copper, volcanic ash, salt, tin ore.

### KINGS

*Land area:* 1559 square miles.

*Population:* 35,168 (1940 census).

*Location:* South-central portion of the State.

*County seat:* Hanford.

*References:* State Mineralogist Report IX:XVII:XVIII:XXVI (Oct., 1930):XXXV.

Kings County, previous to the discovery of Kettleman Hills oil fields in 1928, had little or no mineral output, but in 1929 it ranked seventh in total value of annual mineral production, seventh in 1930, 1938 and 1941-1942; third in 1931; eighth in 1936-1937, and 1943-1944; sixth in 1939.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Natural gas -----	63,648,158 M cu. ft.	\$3,294,746
Petroleum -----	9,459,556 bbls.	10,689,298
Total value -----	-----	\$13,984,044

### LAKE

*Land area:* 1278 square miles.

*Population:* 8,069 (1940 census).

*Location:* About fifty miles north of San Francisco Bay and the same distance inland from the Pacific Ocean.

*County seat:* Lakeport.

*References:* State Mineralogist Report XIV:XVII:XVIII:XX:XXV (July, 1929):XXXIV:XXXV.

Lake County was in thirty-eighth place as to the value of mineral output for 1944, with four different mineral substances, worth \$468,389, compared with \$798,381 in 1943.

Commercial production in 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Mineral water -----	7,185 gals.	\$2,956
Quicksilver -----	3,781 flasks	430,317
Stone, miscellaneous -----	----	30,735
Other minerals -----	----	4,381
Total value -----		\$468,389

### LASSEN

*Land area:* 4531 square miles.

*Population:* 14,479 (1940 census).

*Location:* Northeast portion of State.

*County seat:* Susanville.

*References:* State Mineralogist Report XV:XVII:XVIII:XIX:XXV (Jan., 1929):XXX:XXXII (Oct., 1936).

Lassen County was in fifty-sixth place as a mineral producer for 1944, with an output of \$26,495, compared with \$25,353 which was the value for the previous year.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$24,945
Other minerals -----	1,550
Total value -----	\$26,495

### LOS ANGELES

*Land area:* 4067 square miles.

*Population:* 2,785,643 (1940 census).

*Location:* One of the southwestern coast counties.

*County seat:* Los Angeles.

*References:* State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXIII (July, 1927):XXX:XXXIII (July, 1937):XXXIV-XXXVI.

The mineral production of Los Angeles County for the year 1944 amounted in value to \$108,138,154, as compared with the 1943 total worth \$100,688,245. Los Angeles led the counties of the State in total value of mineral output from 1923 to 1943, inclusive, but was passed by Kern in 1944.

Commercial production for 1944 consisted of thirteen substances and was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Brick and hollow tile -----	----	\$2,065,468
Clay (pottery and oil-well drilling) -----	61,640 tons	85,007
Gold -----	85 fine ozs.	2,975
Mineral water -----	11,563,991 gals.	383,317
Natural gas -----	52,806,375 M cu. ft.	3,843,357
Petroleum -----	88,646,069 bbls.	95,872,140
Silver -----	17 fine ozs.	12
Stone, miscellaneous -----	----	4,596,097
Unapportioned* -----	----	1,289,781
Total value -----		\$108,138,154

\* Includes cement, diatomite, iodine, salt, titanium ore.

### MADERA

*Land area:* 2112 square miles.

*Population:* 23,314 (1940 census).

*Location:* East-central portion of State.

*County seat:* Madera.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXIV (Oct., 1928):XXX:XXXI:XXXIV:XXXVII:XXXVIII.

Madera County was in fifty-fourth place as a mineral producer for 1944, with an output of nine different mineral substances valued at \$74,141, compared with \$55,575 for 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Copper -----	72,221 lbs.	\$9,750
Gold -----	20 fine ozs.	700
Silver -----	180 fine ozs.	128
Unapportioned* -----		63,563
Total value -----		\$74,141

\* Includes mineral paint, natural gas, pumice and volcanic ash, stone (miscellaneous), tungsten ore.

### MARIN

*Land area:* 529 square miles.

*Population:* 52,907 (1940 census).

*Location:* Adjoins San Francisco on the north.

*County seat:* San Rafael.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXII (July, 1926):XXIX:XXXV.

Marin County had forty-second place as to the value of mineral output for 1944, with five different mineral substances. The total was \$312,849, compared with \$280,119 in 1943.

Commercial production included clay (pottery), mineral water, manganese ore, crushed rock, and sand and gravel.

### MARIPOSA

*Land area:* 1453 square miles.

*Population:* 5,605 (1940 census).

*Location:* Most southerly of the Mother Lode counties. East central portion of State.

*County seat:* Mariposa.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXIV (April, 1928):XXXI (Jan., 1935):XXXV:XXXVII.

Mariposa County is one of the distinctly *mining* counties of the State, although it stands but twenty-fifth on the list of counties in regard to the value of its mineral output for 1944, with a total of \$1,306,411, as compared with \$443,693 for 1943. Mariposa County also has been the source of a large tonnage of limestone, which was otherwise credited to cement manufacture in Merced County.

Commercial production with eight different mineral substances for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Copper -----	182,799 lbs.	\$24,678
Gold -----	5,489 fine ozs.	192,115
Lead -----	255,657 lbs.	20,453
Silver -----	115,608 fine ozs.	82,210
Zinc -----	6,688,655 lbs.	762,507
Unapportioned* -----		224,448
Total value -----		\$1,306,411

\* Includes barite, silica (quartz), and stone (miscellaneous).

**MENDOCINO**

*Land area:* 3452 square miles.

*Population:* 27,864 (1940 census).

*Location:* Joins Humboldt County on the south and bounded by the Pacific Ocean on the west.

*County seat:* Ukiah.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXXV.

Mendocino County's mineral output for 1944 was valued at \$152,039 which gave it rank of forty-seventh among the counties of the State as a mineral producer with \$82,480 for 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$68,701
Unapportioned* -----	83,338
Total value -----	\$152,039

\* Includes carbon dioxide, manganese ore, natural gas.

**MERCED**

*Land area:* 1995 square miles.

*Population:* 46,988 (1940 census).

*Location:* About the geographical center of the State.

*County seat:* Merced.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXI (April, 1925):XXXI (Jan., 1935):XXXV.

Merced County ranked twenty-ninth as to the value of mineral output for 1944, with four different mineral substances worth \$853,905, compared with \$1,118,313 for 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	5 fine ozs.	\$175
Stone, miscellaneous -----	---	204,011
Other minerals -----	---	649,719
Total value -----	---	\$853,905

**MODOC**

*Land area:* 3823 square miles.

*Population:* 8,713 (1940 census).

*Location:* The extreme northeast corner of the State.

*County seat:* Alturas.

*References:* State Mineralogist Report XV:XVII:XVIII:XXV (Jan., 1929):XXX:XXXII (Oct., 1936):XXXV.

Modoc County in forty-fifth place for 1944 reported a commercial production as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$220,204
Other minerals -----	35,025
Total value -----	\$255,229



## MONO

*Land area:* 3030 square miles.

*Population:* 2,299 (1940 census).

*Location:* Is bordered by the State of Nevada on the east and is about in the central portion of the State measured on a north and south line.

*County seat:* Bridgeport.

*References:* State Mineralogist Report XV:XVII:XVIII:XX:XXIII (Oct., 1927):XXX:XXXIV:XXXV:XXXVI (April, 1940):XXXVII:XXXVIII.

Mono County is forty-eighth with nine different mineral substances, and reported a commercial production for 1944 as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	9 fine ozs.	\$315
Silver -----	3 fine ozs.	2
Stone, miscellaneous -----	----	15,969
Unapportioned * -----	----	106,887
Total value -----	-----	\$123,173

\* Includes pumice, quicksilver, andalusite, pyrophyllite, tungsten ore.

## MONTEREY

*Land area:* 3330 square miles.

*Population:* 73,032 (1940 census).

*Location:* West-central portion of State, bordering on Pacific Ocean.

*County seat:* Salinas.

*References:* State Mineralogist Report XV:XVII:XVIII:XIX:XXI (Jan., 1925):XXXI:XXXIV:XXXV.

Monterey County had seven different mineral substances during 1944, having a total value of \$4,942,121, as compared with \$1,142,800 for 1943. In the year's total, of the county, is included the value of magnesia, produced prior to 1944, but not previously reported.

In fifteenth place, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$414,595
Unapportioned * -----	4,527,526
Total value -----	\$4,942,121

\* Includes dolomite, magnesia, quicksilver, salt, sandstone, silica (glass sand).

## NAPA

*Land area:* 783 square miles.

*Population:* 28,503 (1940 census).

*Location:* Directly north of San Francisco Bay—one of the 'bay counties.'

*County seat:* Napa.

*References:* State Mineralogist Report XIV:XVII:XVIII:XX:XXV (April, 1929):XXXV.

In 1944 the value of Napa County's mineral output was \$709,686, placing it in thirtieth place on the list of counties, as compared with \$948,557 for 1943.

With seven different mineral substances, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Quicksilver -----	1,176 flasks	\$128,570
Unapportioned * -----	----	581,116
Total value -----		\$709,686

\* Includes asbestos, chromite, mineral water, pumice, stone (miscellaneous).

## NEVADA

*Land area:* 974 square miles.

*Population:* 19,283 (1940 census).

*Location:* North of Lake Tahoe on the eastern border of the State.

*County seat:* Nevada City.

*References:* State Mineralogist Report XVI:XVII:XVIII:XIX:XX:XXVI (April, 1930):XXXI:XXXII:XXXV:XXXXVI (July, 1941).

Nevada County, one of the mountain counties of California, for some years alternated with Amador in the gold lead, but both were passed by Yuba in 1918-1921, also 1923 and 1943. In 1922, 1924, 1929 to 1942, Nevada led all counties in gold output, though it held third place in 1925, 1928, and 1944; and second place in 1926, 1927, and 1943. Nevada County stands thirty-second on the list of counties in regard to value of its mineral output for 1944, with ten different mineral substances, worth \$619,179, as compared with \$890,647 for 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	16,029 fine ozs.	\$561,015
Silver -----	12,752 fine ozs.	9,068
Stone, miscellaneous -----	----	30,150
Unapportioned * -----	----	18,946
Total value -----		\$619,179

\* Includes barite, chromite, copper, lead, manganese ore, tungsten ore.

## ORANGE

*Land area:* 795 square miles.

*Population:* 130,760 (1940 census).

*Location:* Southwest portion of the State, bordering Pacific Ocean.

*County seat:* Santa Ana.

*References:* State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXI (Jan., 1925):XXXI:XXXV:XXXVII.

Orange County, in fourth place as to value of mineral output for 1944, produced twelve mineral substances worth \$33,312,154 compared with \$28,068,896 in 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Clay (pottery) -----	34,627 tons	\$140,316
Gold -----	51 fine ozs.	1,785
Lead -----	36,464 tons	2,917
Natural gas -----	16,704,577 M cu. ft.	1,119,308
Petroleum -----	30,417,719 bbls.	31,227,748
Silver -----	16,318 fine ozs.	11,604
Stone, miscellaneous -----	----	774,797
Zinc -----	98,279 lbs.	11,203
Unapportioned * -----	----	22,476
Total value -----		\$33,312,154

\* Includes copper, mineral water, salt.

**PLACER**

*Land area:* 1395 square miles.

*Population:* 28,108 (1940 census).

*Location:* Eastern border of State directly west of Lake Tahoe.

*County seat:* Auburn.

*References:* State Mineralogist Report XV:XVII:XVIII:XIX:XX:XXIII (July, 1927):XXXI:XXXII (Jan., 1936).

Placer County, in forty-sixth place, with nine different mineral substances was valued at \$250,237, as compared with \$277,238 in 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Chromite -----	512 long tons	\$24,184
Gold -----	407 fine ozs.	14,245
Silver -----	401 fine ozs.	285
Stone, miscellaneous -----	----	8,973
Unapportioned * -----	----	202,550
Total value -----	-----	\$250,237

\* Includes asbestos, brick and hollow tile, clay (pottery), granite.

**PLUMAS**

*Land area:* 2594 square miles.

*Population:* 11,548 (1940 census).

*Location:* Northeastern border of State, south of Lassen County.

*County seat:* Quincy.

*References:* State Mineralogist Report XVI:XVII:XVIII:XIX:XX:XXIV (Oct., 1928):XXIX:XXX:XXXIII (April, 1937):XXXVII.

Plumas County's mineral output for 1944 with five different mineral substances was valued at \$78,714, as compared with \$207,509 in 1943.

In fifty-third place, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Chromite -----	70 long tons	\$2,808
Gold -----	121 fine ozs.	4,235
Silver -----	24 fine ozs.	17
Stone, miscellaneous -----	----	16,765
Other minerals -----	----	54,889
Total value -----	-----	\$78,714

**RIVERSIDE**

*Land area:* 7240 square miles.

*Population:* 105,524 (1940 census).

*Location:* Southern portion of State.

*County seat:* Riverside.

*References:* State Mineralogist Report XV : XVII : XVIII : XX : XXV (Oct., 1929):XXX:XXXI:XXXIV-XXXVII (inc.).

Riverside is the fourth county in the State in size and the fourteenth in regard to the total value of mineral output for 1944. Within its borders are included mountains, desert, and agricultural land. In point of variety Riverside County showed thirteen different mineral substances commercially produced in 1944 with a total value of \$5,203,973, as compared with the 1943 output which was valued at \$5,452,740.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Clay (pottery) -----	74,650 tons	\$197,478
Stone, miscellaneous -----	----	1,416,644
Unapportioned* -----	----	3,589,851
Total value -----		\$5,203,973

\* Includes brick and hollow tile, cement, fluorspar, granite, gypsum, limestone, manganese ore, mineral water, silica (glass sand), tungsten ore.

### SACRAMENTO

*Land area:* 983 square miles.

*Population:* 170,333 (1940 census).

*Location:* North-central portion of State.

*County seat:* Sacramento.

*References:* State Mineralogist Report XV :XVII :XVIII :XX :XXI (Jan., 1925) :XXXI.

Sacramento stands tenth among the counties of the State as a mineral producer; the output for 1944 being valued at \$7,832,687, as compared with the 1943 production, worth \$6,588,998. In regard to gold output alone, this county ranks second, being exceeded by Yuba, the Sacramento product coming from the dredges. With seven different mineral substances, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	23,789 fine ozs.	\$832,615
Natural gas -----	72,644,058 M cu. ft.	5,490,344
Silver -----	1,118 fine ozs.	795
Stone, miscellaneous -----	----	1,390,227
Other minerals -----	----	118,706
Total value -----		\$7,832,687

### SAN BENITO

*Land area:* 1392 square miles.

*Population:* 11,392 (1940 census).

*Location:* West-central portion of State.

*County seat:* Hollister.

*References:* State Mineralogist Report XV : XVII : XVIII : XX : XXII (April, 1926) : XXXIV : XXXV.

San Benito County ranked twenty-first among the counties in regard to the value of total mining production for 1944, having an output worth \$1,985,039, as compared with \$3,528,462 for the previous year.

Commercial output for 1944 included chromite, dolomite, quick-silver, sand, gravel, and crushed rock.

### SAN BERNARDINO

*Land area:* 20,157 square miles.

*Population:* 161,108 (1940 census).

*Location:* Southeastern portion of State.

*County seat:* San Bernardino.

*References:* State Mineralogist Report XV :XVII :XVIII :XIX : XXVI (July, 1930) : XXVII (July, 1931) : XXX : XXXIV : XXXVIII (inc.) : XXXIX (Oct., 1943).

San Bernardino, by far the largest county in the State in area, ranked seventh in regard to the value of mineral output for 1944, with a total of \$23,358,596, as compared with \$22,042,939, the total for 1943.

San Bernardino, for many years (except for 1918), has led all other counties in the State in point of variety of minerals, producing commercially in 1944 a total of thirty-one different substances.

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Clay (pottery) -----	3,873 tons	\$31,716
Copper -----	390,634 lbs.	52,736
Gold -----	919 fine ozs.	32,165
Limestone -----	387,485 tons	633,063
Lead -----	299,278 lbs.	23,942
Manganese ore -----	2,802 long tons	67,075
Silica (quartz and glass sand) -----	29,151 tons	107,442
Tale -----	36,395 tons	417,343
Silver -----	27,249 fine ozs.	19,377
Stone, miscellaneous -----	-----	924,910
Zinc -----	235,448 lbs.	26,841
Unapportioned * -----	-----	21,021,986
Total value -----		\$23,358,596

\* Includes bentonite, borates, brick, bromine, calcium chloride, cement, feldspar, granite, iron ore, lithia, mineral paint, mineral water, potash, salt, salt cake, soda ash, strontium, tungsten ore.

### SAN DIEGO

*Land area:* 4221 square miles.

*Population:* 289,348 (1940 census).

*Location:* Extreme southwest corner of State.

*County seat:* San Diego.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXI (July, 1925):XXX:XXXV (Jan., 1939):XXXVI-XXXVII.

San Diego ranked twenty-second in the total value of its mineral output for the year 1944 with eleven different mineral substances on the commercial list. The value for 1944 was \$1,985,032, as compared with the 1943 output worth \$1,650,586.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	2 fine ozs.	\$70
Silver -----	2 fine ozs.	1
Stone, miscellaneous -----	-----	1,629,510
Unapportioned * -----	-----	355,451
Total value -----		\$1,985,032

\* Includes brick, bromine, granite, magnesia, mineral water, salt, tubemill pebbles.

### SAN FRANCISCO

*Land area:* 46½ square miles.

*Population:* 634,536 (1940 census).

*County seat:* San Francisco.

*References:* State Mineralogist Report XVII:XVIII:XX:XXV (April, 1929):XXXV:XXXVII.

Surprising as it may appear at first glance, San Francisco County is listed among the mineral-producing sections of the State, actual production consisting mainly of crushed rock, sand, gravel, mineral water and gold and silver from beach sands.

In forty-ninth place, commercial production for 1944 had a total value of \$120,000 and was miscellaneous stone.

## SAN JOAQUIN

*Land area:* 1448 square miles.

*Population:* 134,207 (1940 census).

*Location:* Central portion of State.

*County seat:* Stockton.

*References:* State Mineralogist Report XIV : XVII : XVIII : XXI (April, 1925).

San Joaquin County reported a mineral production for 1944 having a total value of \$1,369,198, as compared with \$1,621,661 for 1943.

In twenty-fourth place, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Natural gas -----	11,337,469 M cu. ft.	\$798,908
Miscellaneous stone -----	----	286,017
Unapportioned * -----	----	284,273
Total value -----		\$1,369,198

\* Includes brick and hollow tile, manganese ore, gold, silver.

## SAN LUIS OBISPO

*Land area:* 3334 square miles.

*Population:* 33,246 (1940 census).

*Location:* Bordered by Kern County on the east and the Pacific Ocean on the west.

*County seat:* San Luis Obispo.

*References:* State Mineralogist Report XV : XVII : XVIII : XXI (Oct., 1925) :XXXI (Oct., 1935) :XXXV :XXXVII.

The total value of the mineral production of San Luis Obispo County in 1944, with seven different mineral substances, was \$704,818, as compared with \$1,037,062 in 1943.

In thirty-first place, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Manganese ore -----	725 long tons	\$33,302
Quicksilver -----	921 flasks	104,760
Stone, miscellaneous -----	----	40,043
Unapportioned * -----	----	526,713
Total value -----		\$704,818

\* Includes chromite, mineral water, petroleum, volcanic ash.

## SAN MATEO

*Land area:* 447 square miles.

*Population:* 111,782 (1942 census).

*Location:* Peninsula, adjoined by San Francisco on the north.

*County seat:* Redwood City.

*References:* State Mineralogist Report XVII :XVIII :XXV (April, 1929) :XXIX :XXXV.

San Mateo County had a mineral output in 1944 of five different substances, having a total value of \$2,452,525, as compared with \$3,041,434, the value for 1943.

In twentieth place, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$189,322
Unapportioned* -----	2,263,203
Total value -----	\$2,452,525

\* Includes cement, limestone (shells), and magnesium compounds.

### SANTA BARBARA

*Land area:* 2740 square miles.

*Population:* 70,555 (1940 census).

*Location:* Southwestern portion of State, adjoining San Luis Obispo on the south.

*County seat:* Santa Barbara.

*References:* State Mineralogist Report XV:XVII:XVIII:XIX:XXI (Oct., 1925):XXXII:XXXV.

Santa Barbara County owes its position of sixth place in the State in regard to its mineral output to the presence of productive oil fields within its boundaries. The total value of its mineral production during the year 1944 was \$23,908,079, as compared with \$16,830,725, the output for 1943.

With eight different substances, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Natural gas -----	5,901,658 M cu. ft.	\$389,032
Petroleum -----	21,298,935 bbls.	21,012,512
Stone, miscellaneous -----	----	164,950
Unapportioned* -----	----	2,341,585
Total value -----	-----	\$23,908,079

\* Includes brick, clay (pottery), diatomite, quicksilver.

### SANTA CLARA

*Land area:* 1328 square miles.

*Population:* 174,949 (1940 census).

*Location:* West-central portion of State.

*County seat:* San Jose.

*References:* State Mineralogist Report XVII:XVIII:XXIXXXVI (Jan., 1930):XXIX:XXXV.

Santa Clara County reported a mineral output for 1944 of \$5,288,668 as compared with \$8,128,250, the figure for 1943.

In thirteenth place, with ten mineral substances, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Limestone (part shells) -----	82,925 tons	\$223,851
Stone, miscellaneous -----	----	520,464
Unapportioned* -----	----	4,484,353
Total value -----	-----	\$5,228,668

\* Includes brick, cement, clay (pottery), magnesite, manganese ore, petroleum, quicksilver.

## SANTA CRUZ

*Land area:* 435 square miles.

*Population:* 45,057 (1940 census).

*Location:* Bordering Pacific Ocean, just south of San Mateo County.

*County seat:* Santa Cruz.

*References:* State Mineralogist Report XVII:XVIII:XXII (Jan., 1926):XXIX.

The mineral output of Santa Cruz County amounted to a total of \$1,762,807 for 1944, giving the county a standing of twenty-third among all others in the State in this regard. The 1943 figure was \$2,900,752.

Commercial production for 1944 included bituminous rock, cement, iron ore, limestone, and miscellaneous stone.

## SHASTA

*Land area:* 3858 square miles.

*Population:* 28,800 (1940 census).

*Location:* North-central portion of State.

*County seat:* Redding.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XXII (April, 1926):XXIX (Jan., April, 1933):XXX:XXXIV:XXXV (April, 1939):XXXVI.

Shasta County stood eighteenth in California among the mineral-producing counties in 1944, with an output valued at \$2,615,373, as compared with the 1943 production worth \$3,766,717.

With thirteen different mineral substances, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Chromite -----	398 long tons	\$18,974
Copper -----	2,585,656 lbs.	349,063
Gold -----	1,796 fine ozs.	62,860
Lead -----	500,509 lbs.	40,041
Silver -----	99,765 fine ozs.	70,944
Stone, miscellaneous -----	-----	543,504
Zinc -----	3,013,340 lbs.	343,521
Unapportioned* -----	-----	1,186,466
Total value -----	-----	\$2,615,373

\* Includes asbestos, iron ore, manganese ore, mineral water, pyrite.

## SIERRA

*Land area:* 923 square miles.

*Population:* 3,025 (1940 census).

*Location:* Eastern border of State just north of Nevada County.

*County seat:* Downieville.

*References:* State Mineralogist Report XVI:XVII:XVIII:XX:XXV (April, 1929):XXXI:XXXVIII (Jan., 1942).

Sierra County reported a mineral production of \$114,195 in 1944, which was mainly gold, as compared with the 1943 output worth \$176,016.

In fiftieth place, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$9,900
Other minerals* -----	104,295
Total value -----	\$114,195

\* Includes chromite, gold, silver.



## SISKIYOU

*Land area:* 6256 square miles.

*Population:* 28,598 (1940 census).

*Location:* Extreme north-central portion of State, next to Oregon boundary.

*County seat:* Yreka.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXI (Oct., 1925):XXVIII (Jan., 1931):XXIX:XXX:XXXI (July, 1935):XXXIV:XXXV:XXXVII.

Siskiyou, fifth county in California in regard to size, located in highly mineralized and mountainous country, ranks nineteenth in regard to mineral output with nine mineral substances for 1944. The 1943 production was valued at \$1,896,246.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Chromite -----	2,225 long tons	\$89,650
Copper -----	15,856,568 lbs.	2,140,637
Gold -----	3,682 fine ozs.	128,870
Silver -----	14,348 fine ozs.	10,203
Stone, miscellaneous -----	----	96,369
Unapportioned* -----	----	42,192
Total value -----		\$2,507,921

\* Includes manganese ore, mineral water, pumice.

## SOLANO

*Land area:* 822 square miles.

*Population:* 49,118 (1940 census).

*Location:* Touching San Francisco Bay on the northeast.

*County seat:* Fairfield.

*References:* State Mineralogist Report XIV:XVII:XXIII (April, 1927):XXXV.

Solano, while mostly valley land, produced mineral substances during 1944 to the total value of \$5,973,575, ranking it in twelfth place among the counties of the State, compared with the 1943 output worth \$4,931,944.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Natural gas -----	70,526,204 M cu. ft.	\$5,872,446
Other minerals -----	----	101,129
Total value -----		\$5,973,575

## SONOMA

*Land area:* 1577 square miles.

*Population:* 69,052 (1940 census).

*Location:* South of Mendocino County, bordering on the Pacific Ocean.

*County seat:* Santa Rosa.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXII (July, 1926):XXXV.

Sonoma County ranked twenty-eighth among the counties of California during 1944 with a mineral output valued at \$905,121, compared with \$1,521,314, the 1943 figure.

Commercial production for 1944 included chromite, granite (tuff), limestone (shells), mineral water, manganese ore, quicksilver, and miscellaneous stone.

### STANISLAUS

*Land area:* 1450 square miles.

*Population:* 74,866 (1940 census).

*Location:* Center of State bounded on south by Merced County.

*County seat:* Modesto.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXI (April, 1925):XXXV.

Gold has usually been the chief mineral product of Stanislaus County, but it was exceeded in 1918-1919 and 1944 by manganese, and in 1921-1923, 1925-1934 and 1943 by miscellaneous stone. This county for 1944 ranked thirty-fifth in the State in regard to minerals, with an output valued at \$545,376, as compared with \$1,112,486 in 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	5,066 fine ozs.	\$177,310
Manganese ore -----	5,711 long tons	213,293
Silver -----	180 fine ozs.	128
Stone, miscellaneous -----	----	97,931
Unapportioned * -----	----	56,714
Total value -----		\$545,376

\* Includes clay (pottery), magnetite, natural gas.

### SUTTER

*Land area:* 608 square miles.

*Population:* 18,680 (1940 census).

*Location:* Bounded by Butte County on the north and Sacramento on the south.

*County seat:* Yuba City.

*References:* State Mineralogist Report XV:XVII:XVIII.

Sutter is one of only two counties in the State which for a number of years reported no commercial output of some kind of mineral substance. In 1917 some crushed rock was taken out, from the Marysville Buttes, also in 1925-1928, and 1937-1938.

There has been some utilization of natural gas and clay. Coal is found here, but no deposits of it have been placed on a productive basis.

During 1944 there was a commercial output of pottery clay, natural gas, and sand and gravel, having a total value of \$89,246, which ranked it fifty-second as a mineral-producing county. The 1943 total was \$74,905.

## TEHAMA

*Land area:* 2893 square miles.

*Population:* 14,316 (1940 census).

*Location:* North-central portion of the State, bounded on the north by Shasta.

*County seat:* Red Bluff.

*References:* State Mineralogist Report XV : XVII : XVIII : XIV : XXIV (July, 1928) : XXXVII.

Tehama County stood fifty-first among the mineral-producing counties of the State for 1944, with an output valued at \$101,823, compared with \$72,917 in 1943. Commercial production in 1944 was chromite, crushed rock, sand and gravel.

## TRINITY

*Land area:* 3166 square miles.

*Population:* 3970 (1940 census).

*Location:* Northwestern portion of State.

*County seat:* Weaverville.

*References:* State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXII (Jan., 1926) : XXIX (Jan., April, 1933) : XXX : XXXIV : XXXV : XXXVII (Jan., 1941).

Trinity County's output of minerals was valued at \$516,066 for 1944, as compared with the 1943 figure of \$323,123, which gives the county a rank of thirty-sixth for the year.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	550 fine ozs.	\$19,250
Manganese ore -----	9,753 long tons	367,960
Silver -----	56 fine ozs.	40
Stone, miscellaneous -----	---	13,341
Unapportioned* -----	---	115,475
Total value -----		\$516,066

\* Includes chromite, coal, quicksilver.

## TULARE

*Land area:* 4856 square miles.

*Population:* 107,152 (1940 census).

*Location:* Bounded by Inyo on the east, Kern on the south, Fresno on the north.

*County seat:* Visalia.

*References:* State Mineralogist Report XV : XVII : XVIII : XX : XXXVI : XXXVII.

Tulare County stands thirty-third on the list of mineral-producing counties for 1944, with six different mineral substances, having a total value of \$615,630, as compared with \$301,292 for 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$170,681
Unapportioned* -----	444,949
Total value -----	\$615,630

\* Includes brick, gems (quartz crystals), natural gas, tungsten ore.

## TUOLUMNE

*Land area:* 2190 square miles.

*Population:* 10,887 (1940 census).

*Location:* East-central portion of State—Mother Lode District.

*County seat:* Sonora.

*References:* State Mineralogist Report XIV:XVII:XVIII:XIX:XX:XXIV (Jan., 1928):XXXIV:XXXV:XXXVII.

Tuolumne County ranks thirty-ninth among the counties of the State relative to its total value of mineral output for 1944, with nine different substances. The mineral production for 1944 was valued at \$465,734, as compared with \$783,508 for 1943.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Copper -----	13,993 lbs.	\$1,889
Gold -----	5,796 fine ozs.	202,860
Silver -----	2,852 fine ozs.	2,028
Unapportioned* -----	-----	258,957
Total value -----	-----	\$465,734

\* Includes chromite, dolomite, limestone, soapstone, stone (miscellaneous).

## VENTURA

*Land area:* 1878 square miles.

*Population:* 69,685 (1940 census).

*Location:* Southwestern portion of State, bordering on Pacific Ocean.

*County seat:* Ventura.

*References:* State Mineralogist Report XV : XVII : XVIII : XX : XXI:XXVIII (July-Oct., 1932):XXXVII.

Ventura is fifth in the State in respect to the value of its mineral output for 1944. The 1944 mineral production was worth \$30,545,897, as compared with the 1943 output valued at \$25,080,976.

With seven different mineral substances, commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Natural gas -----	53,179,388 M cu. ft.	\$3,245,920
Petroleum -----	23,797,902 bbls.	26,792,447
Stone, miscellaneous -----	-----	345,962
Unapportioned* -----	-----	161,568
Total value -----	-----	\$30,545,897

\* Includes clay (oil-well drilling), gypsum, limestone.

## YOLO

*Land area:* 1017 square miles.

*Population:* 27,243 (1940 census).

*Location:* Sacramento Valley, bounded by Sutter on the east and Colusa on the north.

*County seat:* Woodland.

*References:* State Mineralogist Report XIV:XVII:XVIII:XXXV.

Yolo County in fortieth place, had a commercial production for 1944 as follows, compared with \$365,176 the preceding year:

<i>Substance</i>	<i>Value</i>
Stone, miscellaneous -----	\$52,724
Unapportioned * -----	341,575
Total value -----	\$394,299

\* Includes natural gas and quicksilver.

## YUBA

*Land area:* 639 square miles.

*Population:* 17,034 (1940 census).

*Location:* Lies west of Sierra and Nevada counties; south of Plumas.

*County seat:* Marysville.

*References:* State Mineralogist Report XV : XVII : XVIII : XX : XXVI (July, 1930) :XXXI.

Yuba County ranked twenty-sixth among the counties of the State as a mineral producer in respect to gold, which is obtained mainly by dredges. The 1943 output was valued at \$1,734,670.

Commercial production for 1944 was as follows:

<i>Substance</i>	<i>Amount</i>	<i>Value</i>
Gold -----	27,853 fine ozs.	\$974,855
Silver -----	1,367 fine ozs.	972
Stone, miscellaneous -----	----	130,484
Total value -----		\$1,106,311



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## CHAPTER EIGHT

### DIRECTORY OF PRODUCERS OF METALLIC AND NON-METALLIC MINERALS IN CALIFORNIA 1944

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NOTE.—The producers of natural gas and petroleum will be found in the quarterly Summary of Operations, California Oil Fields, for July to December, 1944 (Vol. 30. No. 2).





ASBESTOS

Operator	Product	Address	Location of mine
<i>Napa County</i> Kohler & Chase, Geo. Q. Chase	a	26 O'Farrell St., San Francisco	Steel Canyon
<i>Placer County</i> Joe Delmuc & W. Zindars Gold Meadow Mining & Milling Co., Dr. John W. Ross	b *b	Forest Hill 2322 K St., Sacramento	Forest Hill Forest Hill
<i>San Benito County</i> Jack Simas	*a	2232 11th Ave., Oakland	Hernandez
<i>Shasta County</i> Powhatan Mining Co.	b	Woodlawn, Baltimore, Md.	Simas

\* Under development only.  
a Chrysotile short fiber.  
b Tremolite.

BARYTES

Operator	Address	Location of mine
<i>Mariposa County</i> Baroid Sales Division, National Lead Co.	830 Ducommun St., Los Angeles	El Portal
<i>Nevada County</i> Industrial Minerals & Chemical Co., Spanish Mine	836 Gilman St., Berkeley	Washington

BENTONITE (FULLER'S EARTH)

Operator	Address	Location of pit
<i>Inyo County</i> Coen Companies, Inc.----- Commercial Minerals Co.----- Los Angeles Chemical Co.----- Muroc Clay Co.-----	711 Gibbons St., Los Angeles----- 310 Irving St., San Francisco----- 1960 Santa Fe Ave., Los Angeles----- 5525 Randolph St., Maywood-----	----- ----- ----- Olancha-----
<i>Kern County</i> Muroc Clay Co.-----	5525 Randolph St., Maywood-----	Muroc-----
<i>San Bernardino County</i> Baroid Sales Division, National Lead Co.----- Pacific Bentonite Mine, Louis Martinez-----	830 Ducommun St., Los Angeles----- Box 374, Red Mountain-----	Hector Red Mountain-----
<i>San Diego County</i> Standard Oil Co. of Calif.-----	Standard Oil Bldg., San Francisco-----	Palm Siding-----

BITUMINOUS ROCK

Operator	Address	Location of mine
<i>Santa Cruz County</i> Calrock Asphalt Co.-----	232 Montgomery St., San Francisco-----	Majors-----

BORATES

Operator	Address	Location of property
<i>Inyo County</i> Pittsburgh Plate Glass Co., Columbia Chemical Division..... United States Borax Co.....	523 W. 6th St., Los Angeles..... 510 W. 6th St., Los Angeles.....	Bartlett Death Valley
<i>Kern County</i> Pacific Coast Borax Co.....	510 W. 6th St., Los Angeles.....	Kramer
<i>San Bernardino County</i> American Potash and Chemical Corp..... West End Chemical Co.....	Trona..... Latham Square Bldg., Oakland.....	Trona West End

BROMINE

Operator	Address	Location of property
<i>Alameda County</i> Westvaco Chlorine Prod. Corp.....	405 Lexington Ave., New York, N. Y.....	Newark
<i>San Bernardino County</i> American Potash & Chem. Co.....	Trona.....	Trona
<i>San Diego County</i> Westvaco Chlorine Prod. Corp.....	405 Lexington Ave., New York, N. Y.....	San Diego

CADMIUM

Mine	Operator	Address	Location of mine
<i>Butte County</i> Big Bend-----	Hoefling Bros.-----	Box 786, Sacramento-----	Oroville

CALCIUM CHLORIDE

Operator	Address	Location of mine
<i>Imperial County</i> Mullet Island Salt Works-----	Niland-----	Niland
<i>San Bernardino County</i> California Rock Salt Co.-----	2465 Hunter St., Los Angeles-----	Amboy

CARBON DIOXIDE GAS

Operator	Address	Location of wells
<i>Imperial County</i> Cardox Western, Inc.----- National Dry Ice Co.*----- Natural Carbonic Prod., Inc.**-----	748 Washington Blvd., Los Angeles 21 1225 E. 8th St., Los Angeles----- 748 E. Washington Blvd., Los Angeles-----	Niland Niland Niland
<i>Mendocino County</i> Caldri Ice Corp.-----	1168 Battery St., San Francisco-----	Hopland

\* Was taken over by Cardox Western, Inc., on August 1, 1944.  
\*\* Ceased operating plant June 30, 1944.

CEMENT

Operator	Address	Location of mill
<i>Calaveras County</i> Calaveras Cement Co.....	315 Montgomery St., San Francisco.....	San Andreas
<i>Contra Costa County</i> Henry Cowell Lime and Cement Co.....	2 Market St., San Francisco.....	Cowell
<i>Kern County</i> Monolith Portland Cement Co.....	Bartlett Bldg., Los Angeles.....	Monolith
<i>Los Angeles County</i> Blue Diamond Corp.....	1650 S. Alameda St., Los Angeles.....	Los Angeles
<i>Merced County</i> Yosemite Portland Cement Co.**	Merced.....	Merced
<i>Riverside County</i> Riverside Cement Co.....	621 S. Hope St., Los Angeles.....	Riverside
<i>San Benito County</i> Pacific Portland Cement Co.*	417 Montgomery St., San Francisco.....	San Juan
<i>San Bernardino County</i> California Portland Cement Co.....	601 W. Fifth St., Los Angeles.....	Colton
<i>Riverside County</i> Riverside Cement Co.....	621 South Hope St., Los Angeles.....	Oro Grande
<i>Southwestern Portland Cement Co.</i> Southwestern Portland Cement Co.....	503 Roosevelt Bldg., Los Angeles.....	Victorville
<i>San Mateo County</i> Pacific Portland Cement Co.....	417 Montgomery St., San Francisco.....	Redwood City
<i>Santa Clara County</i> Permanence Cement Co.....	Latham Square Bldg., Oakland.....	Permanente
<i>Santa Cruz County</i> Santa Cruz Portland Cement Co.....	Crocker Bldg., San Francisco.....	Davenport

\* Shipment from cement made in 1943.

\*\* Liquidated in 1944.

## CHROMITE

Principal Producers in 1944 Out of a Total of 101 Operating Properties

Mine	Operator	Address	Location of mine
<i>Del Norte County</i>			
Big Dipper	Tyson Chrome Mines, Inc.	406 Montgomery St., San Francisco	Crescent City
Blue Bird	J. E. Eckett & H. D. Miller	Cave Junction, Oregon	Crescent City
Chrome Hill	Don Raymond	Crescent City	Patricks Creek
Doe Flat & Webb	F. Linkhart & E. H. Messenger	Kerby, Oregon	Patricks Creek
4th of July	C. H. McClendon	Crescent City	Crescent City
High Plateau	Eugene Brown	O'Brien, Oregon	Crescent City
Old Doe	J. E. Inman	Crescent City	Crescent City
Rattlesnake Mt.	D. E. Deleray	Crescent City	Crescent City
<i>El Dorado County</i>			
Taylor	Taylor Chrome Mines, Inc.	206 Kohl Bldg., San Francisco 4	Folsom
<i>Glenn County</i>			
Chrome King	A. E. Brickford	Stonyford	Stonyford
<i>Humboldt County</i>			
Fish Creek	Llewellyn O. Wilder	Orleans	Orleans
<i>Placer County</i>			
Capital Co. property	Thad Greene	Forest Hill	Forest Hill
Capital Co. property	B. S. & H. R. Marall	Forest Hill	Iowa Hill
	Dan Sullivan	Alta	Dutch Flat
Sunny Ridge	C. L. Matthews	Forest Hill	Forest Hill
Sunset	B. S. & H. R. Marall	Forest Hill	Forest Hill
Victory (Jessie B)	Chas. Hopper Brown	Box 326, Auburn	Colfax
<i>Plumas County</i>			
Diamond	E. R. Patterson	Oakley	Quincy
<i>San Luis Obispo County</i>			
Castro	Castro Chrome Associates	232 Montgomery St., San Francisco	San Luis Obispo
Pick & Shovel	Mrs. Grace Thornburgh	San Luis Obispo	San Luis Obispo

<i>Siskiyou County</i>					
Black Hawk	Tom Eldridge	Cecilville	Cecilville		Cecilville
J. W. Costello	J. W. Costello	Fort Jones	Fort Jones		Fort Jones
Dry Gulch	Luther Lake	Cecilville	Cecilville		Cecilville
Fairview	Dunsmuir Chrome Co., L. D. Taylor	832 Florence, Dunsmuir	832 Florence, Dunsmuir		Dunsmuir
Genesis	Fairview Chrome Mine, H. E. Ellickson	640 Lane St., Yreka	640 Lane St., Yreka		Hamburg
Lady Gray	Hayden & Thompson	Callahan	Callahan		Callahan
Mary Lou	Mrs. Dorothea Reddy Moroney	Klamath River	Klamath River		Klamath River
Red Mountain	Francis George	Cecilville	Cecilville		Cecilville
	J. K. Rensen	1726 N. Flint Ave., Portland, Oregon	1726 N. Flint Ave., Portland, Oregon		Hamburg
<i>Tehama County</i>					
Franklin	James E. Atkinson	Red Bluff	Red Bluff		Red Bluff
McLaughlin—Applegarth Lease	Geo. A. Applegarth	1628 Russ Bldg., San Francisco	1628 Russ Bldg., San Francisco		Red Bluff
Victory	M. E. Howe	Red Bluff	Red Bluff		Red Bluff
<i>Tuolumne County</i>					
McCormick	Robert McCormick	Jamestown	Jamestown		Jamestown
Horseshoe	J. F. Stuart	707 Bank of America Bldg., Stockton	707 Bank of America Bldg., Stockton		Jamestown
<i>Trinity County</i>					
Shasta Lilly	Philip C. Munko	Castella	Castella		Castella

## CLAY

(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
<i>Alameda County</i>			
California Pottery Co.	a, c	Niles	Niles
N. Clark & Sons	a, b	401 Pacific Ave., Alameda	Alameda
Kraflie Co.	a, b, c	Niles	Niles
<i>Amador County</i>			
M. J. Bacon	c	Ione	Carbondale
Cal. Mineral Products Co., Ione Clay and Sand Pit	c, f	Kohl Bldg., San Francisco	Ione
N. Clark & Sons	e	401 Pacific Ave., Alameda	Ione
Western Refractories Co.	b, c	Russ Bldg., San Francisco	Ione
<i>Calaveras County</i>			
California Pottery Co.	c	Niles	Valley Springs
<i>Contra Costa County</i>			
American Radiator & Standard Sanitary Mfg. Co.,			
H. W. Creeger, Mgr.	a	Box W, Richmond	Richmond
Gladding-McBean & Co.	b	2901 Los Feliz Blvd., Los Angeles	Pittsburg
Port Costa Brick Works, C. G. Berg, Pres.	b	6th and Berry Sts., San Francisco	Port Costa
United Materials & Richmond Brick Co., Ltd.	a, b	Box 7, Richmond	Richmond
<i>Fresno County</i>			
Crayeroft Brick Co.	a, b, c	Belmont & Lafayette Sts., Fresno	Fresno
<i>Humboldt County</i>			
J. D. Thompson Brick Co.	a, b, c	R.F.D. 1, Box 20, Eureka	Eureka
<i>Inyo County</i>			
Coen Companies, Inc.	e	711 Gibbons St., Los Angeles	
Commercial Minerals Co.	e	310 Irving St., San Francisco	
Los Angeles Chemical Co.	e	1960 Santa Fe Ave., Los Angeles	
Muroc Clay Co.	e	5525 Randolph St., Maywood	Olancho
<i>Kern County</i>			
American Minerals Co.	c	5601 S. Boyle, Los Angeles	Cantil
Antelope Mud Co.	d	Box 496, Avenal	Rosamond
Bakersfield Rock Co.	d	Box 395, Sta. A, Bakersfield	Bakersfield
Drileco Ltd.	d	Rosamond	Rosamond
King Lumber Co.	b	Box 1559, Bakersfield	Bakersfield
McKittrick Mud Co., C. C. Sherpenburg	d	McKittrick	McKittrick
Mojave Corp.	d	Box 174, Los Nietos	Frazier Park
Muroc Clay Co.	e	5525 Randolph St., Maywood	Muroc



[illegible]

## CLAY—Continued

(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
<i>Sacramento County</i>			
Cannon & Co.	a, b, c	Box 802, Sacramento	Ben Ali
H. C. Muddox, Jessie E. Muddox, Owner	a	30th and L Sts., Sacramento	Sacramento
Panama Pottery Co.	a	R.F.D. 4, Box 1478, 24th St. Rd., Sacramento	Sacramento
Sacramento Brick Co.	b	1300 Front St., Sacramento	Sacramento
<i>San Bernardino County</i>			
Baroid Sales Div., National Lead Co.	d, c	830 Ducommun St., Los Angeles	Hector
Hancock Brick Yard, C. P. Hancock & Son	b	Riverside	Highgrove
Gladding-McBean & Co.	c	2901 Los Feliz Blvd., Los Angeles	Goff
Master Mining Co.	c	530 W. 6th St., Los Angeles 14	Bryman
Pacific Bentonite Mine, Louis Martinez	c	Box 374, Red Mountain	Red Mountain
Southern California Minerals Co., W. K. Skeoch	c	320 S. Mission Rd., Los Angeles	Goff
Temescal Clay Co.	g	6801 Dorothy Ave., South Gate	Hicks
<i>San Diego County</i>			
Union Brick Co., J. W. Rice	b	P.O. Box 356, North San Diego	Rose Canyon
<i>San Joaquin County</i>			
Laurel Potteries	a	McKinley Ave., Stockton	Stockton
Pacific Clay Products Co.	a	Box 145, Station A, Los Angeles	Stockton
San Joaquin Brick Co.	b	33 S. El Dorado St., Stockton	Stockton
Stockton Brick & Tile Co.	a, b, c	McKinley Ave., Stockton	Stockton
<i>Santa Barbara County</i>			
McNall Building Materials	a, b, c	208 N. Salsipuedes, Santa Barbara	Santa Barbara
<i>Santa Clara County</i>			
Garden City Pottery	a	560 N. 6th St., San Jose	San Jose
Gladding Bros. Mfg. Co.	a, b, c	S. 3d and Keyes Sts., San Jose	San Jose
Myers Ceramic Pottery, F. Hinz	a	Box 97, Santa Clara	Santa Clara
Remillard-Dandini Co.	b	569 3d St., Oakland	San Jose
<i>Stanislaus County</i>			
Lester Raggio	c	Knights Ferry	Knights Ferry

a. Clay products. b. Brick and hollow building-tile. c. Crude clay. d. Oil-well drilling-mud. e. Filtering clay. f. Fire sand.

CLAY—Continued  
(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
<i>Sutter County</i> Gladding, McBean & Co.	c	2901 Los Feliz Blvd., Los Angeles	Nicolaus
<i>Tulare County</i> San Joaquin Materials Co.	b	744 G St., Fresno	Exeter
<i>Ventura County</i> Shell Oil Co., Dent Clay Pit	d	Shell Bldg., San Francisco	Ventura

a. Clay products. b. Brick and hollow building-tile. c. Crude clay. d. Oil-well drilling-mud. e. Filtering clay. f. Fire sand.

COAL

Operator	Address	Location of mine
<i>Amador County</i> Buena Vista Coal Mine, G. E. Morrison	Box 203, Ione	Ione
<i>Trinity County</i> Trinity Coal Co., Wm. A. Mumford	Weaverville	Douglas City

## COPPER

Principal Copper Producers in California in 1944 (not less than 10,000 pounds)

Mine	Operator	Address	Post office of mine
<i>Butte County</i> Big Bend-----	Hocfling Bros.-----	Box 786, Sacramento-----	Oroville
<i>Calaveras County</i> Collier-----	Ernest A. Vogt-----	101 Palm Drive, Piedmont-----	Copperopolis
Keystone-----	Keystone Copper Corp.-----	Copperopolis-----	Copperopolis
Penn-----	Eagle Shawmut Mine-----	Chinese Camp-----	Chinese Camp
Quail Hill-----	G. Ivan Smith-----	Copperopolis-----	Copperopolis
Union-----	Pacific Mining Co.-----	1022 Crocker Bldg., San Francisco-----	Farmington
<i>El Dorado County</i> Pioneer-Lilyama-----	Pioneer-Lilyama Mines-----	Placerville-----	Placerville
<i>Inyo County</i> Columbia No. 2-----	Shoshone Mines, Inc.-----	Tecopa-----	Tecopa
Darwin-----	Darwin Mines, Arthur J. Theis, Trustee-----	Darwin-----	Darwin
Gold Bottom-Ophir-----	Damon & Damon-----	Bin 14, Trona-----	Trona
Pine Creek-----	United States Vanadium Corp.-----	30 East 42d St., New York, N. Y.-----	Bishop
<i>Madera County</i> Victory-----	Pietro Rosati-----	Raymond-----	Raymond
<i>Mariposa County</i> Blue Moon-----	Red Cloud Mines, Inc.-----	Wallace, Idaho-----	Hornitos
<i>San Bernardino County</i> Copper World-----	L. D. Forman-----	850 South 14th West St., Salt Lake City, Utah-----	Cima
Mohawk-----	Dunton-Ray & Greenwood-----	Wheatong Springs via Nipton-----	Nipton
Van Trigger-----	Dutch Oven Mining Co.-----	Ivan-----	Essex
<i>Shasta County</i> Hornet-----	The Mountain Copper Co.-----	216 Pine St., San Francisco-----	Matheson
-----	Clayton T. McNeil, and C. Erb Wuensch-----	Summit City-----	Summit City
<i>Siskiyou County</i> Dakin (Gray Eagle)-----	Gray Eagle Copper Co.-----	Happy Camp-----	Happy Camp

DIATOMITE (DIATOMACEOUS EARTH)

Operator	Address	Location of quarry or mine
<i>Los Angeles County</i> Great Lakes Carbon Corp., Dicalite Division.....	756 S. Broadway, Los Angeles.....	San Pedro
<i>Santa Barbara County</i> Johns-Manville Products Corp..... Lompoc Diatomite Co.....	Lompoc..... 405 Montgomery St., San Francisco.....	Lompoc Lompoc

DOLomite

Operator	Address	Location of quarry
<i>Monterey County</i> Bethlehem Steel Co., Sterling Ranch Quarry..... Permanente Metals Corp.....	20th and Illinois, San Francisco..... Permanente.....	Natividad Natividad
<i>San Benito County</i> Archie E. Hamilton.....	Hollister.....	Hollister
<i>Tuolumne County</i> U. S. Lime Products Corp.*.....	85 2d St., San Francisco.....	Sonora

\* Output partly used in lime.

FELDSPAR

Operator	Address	Location of mine
<i>Fresno County</i> W. H. Childer	Box 671, Fresno	Friant
<i>San Bernardino County</i> Gladding, McBean & Co.	2901 Los Feliz Blvd., Los Angeles	
<i>San Diego County</i> Mica Gem Mining & Milling Co.*, T. J. Williams	Box 119, La Mesa	Jacumba

\* Mined, stockpiled but did not ship.

FLUORSPAR

Operator	Address	Location of mine
<i>Riverside County</i> Roy Cornell	1429 Santa Fe Ave., Los Angeles	Rice

GEMS AND JEWELERS' MATERIALS

Operator	Address	Variety
<i>Calaveras County</i> H. V. Davis Quartz Crystal Products Co.	1934 Filbert St., Oakland San Andreas	Quartz crystals Quartz crystals

GOLD

Principal gold producers in California out of a total of placer operators and lode mines in 1944. (Not less than 200 ounces.)

Mine	Type of mine	Operator	Address	Post office of mine
<i>Amador County</i> Central and Old Eureka	a	Central Eureka Mining Co.	Sutter Creek	Sutter Creek
<i>Butte County</i> Big Bend	o	Hoefling Bros.	Box 786, Sacramento	Oroville
Feather River Channel	h	Golden Feather Dredging Co.	Route 2, Oroville	Oroville
Morris Ravine	f	Morris Ravine Mining Co.	Oroville	Oroville
Oroville Dredge	e	Oroville Gold Dredging Co.	2052 Bird St., Oroville	Oroville
<i>Calaveras County</i> Carson Hill	a	Carson Hill Gold Mining Co.	Melones	Melones
Penn.	o	Eagle Shawmut Mine	Chinese Camp	Chinese Camp
Quail Hill	o	G. Ivan Smith	Copperopolis	Copperopolis
<i>Inyo County</i> Columbia No. 2	m	Shoshone Mines, Inc.	Tecopa	Tecopa
Gold Bottom-Ophir	b, p	Damon & Damon	Bin 14, Trona	Trona
Reward (Brown Monster)	a	T. L. Bright	Owens	Lone Pine
<i>Kern County</i> Tropico	a	Burton Bros., Inc.	Rosamond	Rosamond
<i>Mariposa County</i> Blue Moon	o	Red Cloud Mines, Inc.	Wallace, Idaho	Hornitos
Mount Gaines	a	Mount Gaines Mining Co.	Hornitos	Hornitos
Pine Tree & Josephine	a	Pacific Mining Co.	1922 Crocker Bldg., San Francisco	Bear Valley
Schroeder	a	Schroeder, Odgers & Schroeder	Midpines	Midpines
<i>Nevada County</i> Empire, North Star, et al.	a	Empire Star Mines Co., Ltd.	Box 1027, Grass Valley	Grass Valley
Idaho Maryland-Brunswick	a	Idaho Maryland Mines Corp.	Russ Bldg., San Francisco	Grass Valley
<i>Sacramento County</i> Fair Oaks	t	Fair Oaks Gravel Co.	1401 42d St., Sacramento	Fair Oaks
Natomas	e	Natomas Co.	Forum Bldg., Sacramento	Natomas

a. Lode gold mine. b. Gold-silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucketline). f. Drift mine. g. Hydraulic mine. h. Dragline operations. i. Copper-gold mine. k. Power shovel or dryland dredge. m. Lead mine. n. Suction dredge. o. Zinc mine. p. Silver-lead-zinc. r. Tungsten mine. s. Copper-zinc mine. t. Gravel plant.

## GOLD—Continued

Principal gold producers in California out of a total of placer operators and lode mines in 1944. (Not less than 200 ounces.)

Mine	Type of mine	Operator	Address	Post office of mine
<i>San Bernardino County</i> Roosevelt-----	a	Roosevelt Mines, Inc.	Ludlow-----	Ludlow
<i>San Joaquin County</i> Lower Comanche dredge-----	e	Gold Hill Dredging Co.	311 California St., San Francisco-----	Camanche
<i>Shasta County</i> Hornet----- Kutras Tract----- St. Jude-----	s t a	The Mountain Copper Co. Columbia Construction Co., Inc. St. Jude Mining Co.	216 Pine St., San Francisco----- Redding----- Russ Bldg., San Francisco-----	Matheson Redding French Gulch
<i>Sierra County</i> Original 16 to 1-----	a	Original Sixteen to One Mine, Inc.	Alleghany-----	Alleghany
<i>Siskiyou County</i> Dakin (Gray Eagle)-----	j	Gray Eagle Copper Co.	Happy Camp-----	Happy Camp
<i>Stanislaus County</i> Tuolumne Gold dredge-----	e	Tuolumne Gold Dredging Co.	1 Montgomery St., San Francisco-----	La Grange
<i>Trinity County</i> Oak Hill-----	h	Goldfield Consolidated Mines Co.	1 Montgomery St., San Francisco-----	Junction City
<i>Tuolumne County</i> Eagle Shawmut-----	a	Miller and Clemson-----	4800 Santa Fe Ave., Los Angeles-----	Chinese Camp
<i>Yuba County</i> Yuba Unit-----	e	Yuba Consolidated Gold Fields-----	351 California St., San Francisco-----	Hammonton

a. Lode gold mine. b. Gold-silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucketline). f. Drift mine. g. Hydraulic mine. h. Dragline operations. i. Copper-gold mine. k. Power shovel or dryland dredge. m. Lead mine. n. Suction dredge. o. Zinc mine. p. Silver-lead-zinc. r. Tungsten mine. s. Copper-zinc mine. t. Gravel plant.



GRANITE

Operator	Product	Address	Location of quarry
<i>Fresno County</i> Superior-Academy Granite Co.	a	Clovis	Academy
<i>Lassen County</i> Greig Quarry, J. B. Wagender	a	Susanville	Susanville
<i>Placer County</i> Union Granite Co., Ruhlala Bros. Victor Wickman	a a	Rocklin Rocklin	Rocklin Rocklin
<i>Riverside County</i> Emil Johnson	a	Perris	Perris
<i>San Bernardino County</i> Texas Quarries, Inc.	a	Box 605, Victorville	Victorville
<i>San Diego County</i> Crystal Black Quarry, John Stridsburg Pacific Cut Stone & Granite Co.	a a	Escondido 414 S. Marengo Ave., Allambra	Spooks Canyon Escondido
<i>Sonoma County</i> S. Cabrol	b, c	Glen Ellen	Glen Ellen

a. Granite used in building and monumental stone. b. Tuff used as building stone. c. Volcanic rock used as flagstone and building stone.

## GYPSUM

Operator	Address	Location of quarry
<i>Alameda County</i> Westvaco Chlorine Prod. Corp.*	Newark	Newark
<i>Imperial County</i> Imperial Gypsum Quarry, Pacific Portland Cement Vesubio Mining Corp., Ltd., Louis F. Vremsak	417 Montgomery St., San Francisco Cal Mexico	Plaster City Seeley
<i>Kern County</i> Jennie E. Daly, Koehn Gypsum Plant Handel & Son H. M. Holloway Star Gypsum Co.	Cantil Shafter Box 310, Lost Hills P.O. Box 204, Lost Hills	Salt Dale Lost Hills Lost Hills Lost Hills
<i>Riverside County</i> U. S. Gypsum Co.	300 W. Adams St., Chicago 6, Illinois	Midland
<i>Ventura County</i> A. H. Lange Monolith Portland Cement Co.	Box 194, Tehachapi Bartlett Bldg., Los Angeles	Cuyama Valley Cuyama Valley

\* Output not included in production figures as gypsum is by-product of chemical process using minerals already included in State total.

IODINE

Operator	Address	Mine
<i>Los Angeles County</i> Deepwater Chemical Co., Ltd. The Dow Chemical Co.	Box 588, Compton Midland, Mich.	Compton Long Beach and Venice

IRON

Operator	Address	Location of mine
<i>San Bernardino County</i> Kaiser Co., Inc., Iron and Steel Division	515 Latham Square Bldg., Oakland	Kelso
<i>Santa Cruz County</i> Santa Cruz-Nevada Co.	532 Berry St., San Francisco	Aptos
<i>Shasta County</i> Shasta Iron, Carrico & Bautier	365 Ocean Ave., San Francisco	Heroult

## LEAD

Principal lead producers in California in 1944 (not less than 10,000 pounds)

Mine	Operator	Address	Post office of mine
<i>Butte County</i> Big Bend-----	Hochling Bros.-----	Box 786, Sacramento-----	Oroville
<i>Calaveras County</i> Collier----- Penn----- Quail Hill-----	Ernest A. Vogt----- Eagle Shawmut Mine----- G. Ivan Smith-----	101 Palm Drive, Piedmont----- Chinese Camp----- Copperopolis-----	Copperopolis Chinese Camp Copperopolis
<i>Inyo County</i> Big Four----- Cerru Gordo----- Columbia No. 2----- Darwin----- Gold Bottom-Ophir----- Honolulu-Big Horn (Gibraltar)----- Keeler, Last Chance & Wallace----- Minietta-----	Silas Ness----- Imperial Metals, Inc.----- Shoshone Mines, Inc.----- Darwin Mines, Arthur J. Theis, Trustee----- Damon & Damon----- Southwest Lead & Zinc Co.----- L. D. Foreman----- L. J. Bacoccina-----	Panamint Springs----- Keeler----- Tecopa----- Darwin----- Bin 14, Trona----- 433 South Spring St., Los Angeles----- 850 South 14th West St., Salt Lake City, Utah----- Panamint Springs-----	Panamint Springs Keeler Tecopa Darwin Trona Ballarat Keeler Panamint Springs
<i>Mariposa County</i> Blue Moon-----	Red Cloud Mines, Inc.-----	Wallace, Idaho-----	Hornitos
<i>Orange County</i> Silverado-----	Blue Light Silver Mines Co.-----	508 Chapman Bldg., Fullerton-----	Fullerton
<i>San Bernardino County</i> Lady Luck----- Mohawk----- New Southerland Divide----- Sagamore-----	James A. Boland----- Dunton-Ray & Greenwood----- New Southerland Divide Mining Co.----- California Sulphur Co.-----	Cima----- Wheaton Springs via Nipton----- Yermo----- Ivanpah-----	Cima Nipton Yermo Ivanpah
<i>Shasta County</i> Hornet-----	The Mountain Copper Co.----- Clayton T. McNeil and C. Erb Wuensch-----	216 Pine St., San Francisco----- Summit City-----	Matheson Summit City

## LIME AND LIMESTONE

Operator	Product	Address	Location of quarry
<i>Alameda County</i> Westvaco Chlorine Prod. Corp.---	a, d	Newark-----	Newark
<i>El Dorado County</i> Diamond Springs Lime Co.----- El Dorado Limestone Co., J. H. Bell, Pres.---	a, b, c b	Diamond Springs----- Shingle Springs-----	Diamond Springs Shingle Springs
<i>Inyo County</i> Blue Star Mines, Ltd.-----	b	Room 510, 810 S. Spring St., Los Angeles-----	Zurich
<i>Riverside County</i> Howard Small-----	b, c	331 Main St., Riverside-----	Riverside
<i>San Bernardino County</i> Cal. Portland Cement Co.----- Chubbuck Lime Co., Chas. I. Chubbuck Marter Mining Co.----- Victorville Lime Rock Co.-----	a, b a, b, c b	601 W. 5th St., Los Angeles----- 5000 Worth St., Los Angeles----- 530 West Sixth St., Los Angeles----- 5225 Wilshire Blvd., Los Angeles-----	Colton Chubbuck Lucerne Valley Victorville
<i>San Mateo County</i> Pacific Portland Cement Co.-----	c, d	417 Montgomery St., San Francisco-----	Redwood City
<i>Santa Clara County</i> Bay Shell Co.----- Beck Dredging Co.----- Permanente Cement Co.-----	c, d c, d b	503 Market St., San Francisco----- 305 Parrott Dr., San Mateo----- Permanente-----	Alviso Alviso Permanente
<i>Santa Cruz County</i> Henry Cowell Lime and Cement Co.----- Pacific Limestone Prod. Co.-----	a, b b, c	2 Market St., San Francisco----- Spring St., Santa Cruz-----	Santa Cruz Santa Cruz
<i>Sonoma County</i> Capt. Frank Resech-----	c, d	500 Keokuk, Petaluma-----	Petaluma
<i>Tuolumne County</i> Walter C. Sundburg----- U. S. Lime Products Corp.-----	b a, b, c	Box 653, Sonora----- 58 Sutter St., San Francisco-----	Sonora Sonora
<i>Ventura County</i> Western Lime Products Co.-----	b, c	6305 Yucca St., Los Angeles-----	Santa Susana

a. Producer of burnt lime. b. Producer of limestone. c. Agricultural lime. d. Shells.

## LITHIA

Operator	Address	Location of mine
<i>San Bernardino County</i> American Potash & Chemical Corp.....	Trona.....	Trona

## MAGNESITE

Operator	Address	Location of mine
<i>Alameda County</i> Westvaco Chlorine Prod. Corp.*.....	405 Lexington Ave., New York, N. Y.....	Newark
<i>Santa Clara County</i> Westvaco Chlorine Prod. Corp., Lessee, Western Magnesite Mine.....	405 Lexington Ave., New York, N. Y.....	Red Mountain
<i>Stanislaus County</i> Westvaco Chlorine Prod. Corp., Lessee, Bald Eagle Mine.....	405 Lexington Ave., New York, N. Y.....	Gustine

\* Magnesite calcined only.

## MAGNESIA AND OTHER MAGNESIUM COMPOUNDS

Operator	Product	Address	Location of plant
<i>Alameda County</i> Westvaco Chlorine Prod. Corp.....	Hydroxide.....	405 Lexington Ave., New York, N. Y.....	Newark
<i>Monterey County</i> The Permanente Metals Corp.....	Oxide.....	Permanente.....	Moss Landing
<i>San Diego County</i> Westvaco Chlorine Prod. Corp.....	Chloride.....	405 Lexington Ave., New York, N. Y.....	San Diego
<i>San Mateo County</i> Marine Magnesium Prod. Corp., R. E. Clarke.....	Carbonate hydroxide and oxide.....	South San Francisco.....	South San Francisco
Plant Rubber; Asbestos Works.....	Carbonate.....	537 Brannan St., San Francisco.....	Redwood City

MARBLE

Operator	Address	Location of quarry
<i>Inyo County</i> Inyo Marble Co.....	726 E. 29th St., Los Angeles.....	Lone Pine

MICA

Operator	Product	Address	Location of mine
<i>Imperial County</i> Western Non-metallic Co., C. F. Allebrand.....	a	Ogilby.....	Ogilby
<i>San Diego County</i> Mica Gem Mining & Milling Co *.....	b	P.O. Box 119, La Mesa.....	Jacumba

a. Sericite mica schist. b. Scrap mica.  
\* Mined and stockpiled; no shipments made.

MINERAL PAINT

Operator	Address	Location of property
<i>Madera County</i> H. C. Merritt, Jr., Madera Paint.....	P.O. Box 930, Madera.....	Madera
<i>San Bernardino County</i> Rowe & Buehler.....	1555 Sunset Ave., Pasadena.....	Lavie

## MANGANESE ORE

Principal producers out of 65 operating properties

Operator	Address	Location of mine
<i>Amador County</i> Crabtree & Sullivan	Jackson	Jackson
<i>Colusa County</i> Black Diamond Mine, A. E. Brickford	Stonyford	Stonyford
<i>Glenn County</i> K. B. Mine, M. E. Hawe	Red Bluff	Stonyford
<i>Humboldt County</i> The Crossman Co. Fort Baker Mine, James I. Scott & Co. Fort Steward Mine, J. P. Warren R. F. Helmke	Alderpoint P.O. Box 624, Fortuna 605 Market St., San Francisco Garberville	Alderpoint Showers Pass Fort Steward Alderpoint
<i>Imperial County</i> Whedon Manganese Mines, V. B. Whedon	511 N. Roxbury Dr., Beverly Hills	Glamis
<i>Marin County</i> L. R. Knutte	Nave Bldg., Novato	Novato
<i>Mendocino County</i> R. F. Helmke Lucky Boy Mine, Car-Cor Van Minerals Co.	Garberville La-Z Moon Ranch, Willits	Alderpoint Potter Valley
<i>Plumas County</i> Mt. Hough Mine, George Holloway Western Manganese Mine, O. H. Griggs	Quincy Crescent Mill	Keddie Crescent Mill
<i>Riverside County</i> Arlington Group, A. B. Miner	11143 Washington Blvd., Culver City	Inca
<i>San Bernardino County</i> Black Magic Mines, Harry Nasland Kern Leasing Co., Howard W. Orwig W. Earl Thurber	444 N. Camden Drive, Beverly Hills 1079½ Leighton Ave., Los Angeles 116 N. Madison Ave., Monrovia	Barstow Pisgah
<i>San Joaquin County</i> Johnson Manganese Mining Co. Phil Winegar	1007 Merchants Exchange Bldg., San Francisco Box 246, Vernalis	Vernalis Vernalis



<i>San Luis Obispo County</i> Shelby Elliott, Irish Hill Manganese Mine.....	Box 95, San Luis Obispo.....	San Luis Obispo
<i>Santa Clara County</i> Black Oak & Matt Mine, Barker Corp.....	Box 696, Patterson.....	Patterson
<i>Shasta County</i> Old Bill Mine, Thomas E. Reynolds..... Nigger Hill Mine, O. W. Blevins & W. F. Lloyd.....	Davis..... Box 1603, Redding.....	Ono Ono
<i>Siskiyou County</i> Grey Ledge Mine, A. E. von Goerlitz.....	Sawyers Bar.....	Sawyers Bar
<i>Stanislaus County</i> Buckeye Mine, Verner Allen..... Peter Moy & Liberty mines, Barker Corp.....	150 Montgomery St., San Francisco..... Box 696, Patterson.....	Vernalis Patterson
<i>Trinity County</i> Double A Mine, J. B. Girden..... Ray F. Helms..... J. M. McKnight..... Promise Mine, J. K. Griffith Mining & Development Co..... J. P. Warren..... Hale Creek Mine, Western Metals Co.....	Box 5, Altoona..... Garberville..... Ruth..... 2235 J St., Eureka..... 605 Market St., San Francisco..... 326 Treat Ave., San Francisco.....	Fort Seward Alderpoint Ruth Ruth Fort Seward Mad River

## MINERAL WATER

Operator	Address	Location of spring
<i>Butte County</i> Richardson Mineral Springs, Lee Richardson, Mgr.	Richardson Springs	Richardson Springs
<i>Calaveras County</i> Mok-Hill Mineral Springs Seven Up Bottling Co.	2512 Broadway, Sacramento 17	Mokelumne Hill
<i>Contra Costa County</i> Alhambra Water Co. Fox Water Co.	Martinez 675 37th St., Oakland	Martinez Oak Springs
<i>Lake County</i> Adams Mineral Springs, Clarence Prather. Bartlett Springs Co. Howard Hot Springs, J. P. Francisco. Norman Mineral Springs, H. C. Norman, Mgr. Witter Medical Springs, W. E. Whitaker.	Adams, via Middletown. Bartlett Springs, via Williams. Middletown. Middletown. 1265 4th Ave., San Francisco.	Adams Bartlett Springs Middletown Middletown Witter Springs
<i>Los Angeles County</i> Deep Rock Artesian Water. Elysian Spring Water Co. Frespuero Artesian Water. Holly Spring Water. Indian Head Mineral Water. Magnetic Spring Water Co. Mountain Spring Water Co. Sparklett Bottled Water Corp.	4416 York Blvd., Los Angeles. 1536 Baxter, Los Angeles. 4430 York Blvd., Los Angeles. 2298 Holly Dr., Los Angeles. 3640 N. Griffin Ave., Los Angeles. 936 Palm Ave., Sherman. 226 S. Avenue 54, Los Angeles. 4500 York Blvd., Los Angeles.	Los Angeles Los Angeles Los Angeles Los Angeles Los Angeles Los Angeles Los Angeles
<i>Marin County</i> Purity Spring Water Co.	2032 Kearny St., San Francisco	
<i>Napa County</i> Calistoga Bottling Works, Ernest Mainini. Samuels Soda Springs, T. B. Grigsby.	Calistoga Monticello	Calistoga Monticello
<i>Orange County</i> La Vida Mineral Springs Co.	Route 1, Placentia	Carbon Canyon

<i>Riverside County</i> Beulah Springs, Oscar C. McNicholl.....	Arlington.....	Arlington
<i>San Bernardino County</i> Arrowhead & Puritas Waters, Inc.....	1566 E. Washington Blvd., Los Angeles.....	Arrowhead
<i>San Diego County</i> Rock Springs Co., L. H. Walek.....	Route 2, Box 224-A, Escondido.....	Escondido
<i>San Luis Obispo</i> New Crystal Spring Water Co., Ellen M. Hudson.....	Route 2, Box 129, San Luis Obispo.....	San Luis Obispo
<i>Shasta County</i> Hilltop Spring Water Co.....	Redding.....	Shasta
<i>Siskiyou County</i> Coca Cola Bottling Co., Fred J. Meamber, Prop..... The Shasta Water Co.....	Yreka..... 6th and Brannan Sts., San Francisco.....	Little Shasta Dunsmuir
<i>Sonoma County</i> Agua Caliente Springs Co., T. H. Corcoran, Prop..... Barcal Springs, John Kolling.....	Agua Caliente..... Cloverdale.....	Agua Caliente Cloverdale

MOLYBDENUM ORE

Mine	Operator	Address	Location of mine
<i>Inyo County</i> Pine Creek Mine.....	United States Vanadium Corp.....	Bishop.....	Bishop

## POTASH

Operator	Address	Location of plant
<i>San Bernardino County</i> American Potash and Chemical Co.	Trona	Trona

## PUMICE AND VOLCANIC ASH

Operator	Product	Address	Location of property
<i>Inyo County</i> American Pumice Co.	a	1026 Pacific Mutual Bldg., Los Angeles	Little Lake
Pacific Coast Pumice Co., C. W. Churchill	a	P.O. Box 656, Bishop	Bishop
Western Talc Co.	a	1901 E. Slauson Ave., Los Angeles	Shoshone
<i>Kern County</i> Calsilico Corp., G. A. Reynolds	b	445 S. Analia Ave., Los Angeles	Cantil
Cudahy Packing Co.	b	803 Macy St., Los Angeles	Ceneda
<i>Madera County</i> Calif. Industrial Minerals, c/o Forrest S. Taylor	b	Friant	Friant
Pacific Pumice Materials Co., W. E. Selink	a	1047 N. Hunter St., Stockton	Friant
<i>Modoc County</i> Glass Mt. Volcolite Co., H. W. Free	a	Tionesta	Tionesta
<i>Mono County</i> American Pumice Co.	a	1026 Pacific Mutual Bldg., Los Angeles	Laws
U. S. Pumice Supply Co.	a	1320 Corporation Bldg., Los Angeles	Laws
<i>Napa County</i> Basalt Rock Co.	a	8th St., Napa	Monticello
<i>San Luis Obispo County</i> Red Eagle Mine, M. L. Francis	b	Creston	Creston
<i>Siskiyou County</i> Glass Mt. Volcolite Co., H. W. Free	a, c, d	Tionesta	Glass Mountain
Klamath Concrete Pipe Co.	a	Klamath Falls, Oregon	

a. Pumice, aggregate. b. Volcanic ash. c. Scoria. d. Pumice for scouring brick.

PYRITE

Operator	Address	Location of mine
<i>Shasta County</i> Mountain Copper Co., Wm. F. Kett, Mgr.....	216 Pine St., San Francisco.....	Matheson

QUICKSILVER

*Principal Producers in California for 1943 out of a total of 63 operating properties*

Mine	Operator	Address	Location of mine
<i>Contra Costa County</i> Mt. Diablo.....	Bradley Mining Co.....	Crocker Bldg., San Francisco.....	Clayton
<i>Inyo County</i> Coso.....	King Mining Co., Lloyd King.....	Little Lake.....	Little Lake
<i>Lake County</i> Abbott.....	International Metals Dev. Inc., C. O. Reed, Mgr.....	Williams.....	Wilbur Springs
Great Western & Ballion.....	Bradley Mining Co.....	Crocker Bldg., San Francisco.....	Middletown
Helen.....	Scott Kline & L. S. Peterson.....	Middletown.....	Middletown
Mirabel.....	Mirabel Quicksilver Co.....	Middletown.....	Middletown
Sulphur Bank.....	Bradley Mining Co.....	Crocker Bldg., San Francisco.....	Clearlake Park
<i>Napa County</i> Eureka.....	A. Garcia.....	Box 513, Middletown.....	Pope Valley
Knoxville.....	Geo. E. Gamble.....	1431 Waverly St., Palo Alto.....	Monticello
Manhattan Mine.....	Chas. Wilson & W. M. Hickox.....	Monticello.....	Monticello
Oat Hill.....	H. W. Gould & Co.....	Penthouse, Mills Bldg., San Francisco.....	Aetna Springs
Oat Hill Extension.....	Zack Anderson.....	Middletown.....	Aetna Springs
<i>San Benito County</i> New Idria.....	New Idria Quicksilver Mining Co.....	Mills Bldg., San Francisco.....	Idria
Stayton Quicksilver.....	R. B. Knox.....	Hollister.....	Hollister

## QUICKSILVER—Continued

Principal Producers in California for 1943 out of a total of 63 operating properties

Mine	Operator	Address	Location of mine
<i>San Luis Obispo County</i>			
Buena Vista	A. R. McCartney	Salinas	Paso Robles
Buena Vista	Virgil Smith*	Paso Robles	Paso Robles
Buckeye	Oscar E. Hanno	Box 242, Cambria	Cambria
Klau	H. W. Gould & Co.	Mills Bldg., San Francisco	Adelaida
Oceanic	Oceanic Mining Co.	Cambria	Cambria
<i>Santa Barbara County</i>			
Los Prietos	Falcon Mercury Co.	Box 117, Santa Barbara	Santa Barbara
<i>Santa Clara County</i>			
Guadalupe	Laco Mining Co., H. N. Mason	Rt. 3, Box 412, Los Gatos	Los Gatos
New Almaden	New Almaden Corp., C. N. Schuette, Gen. Mgr.	204 Sharon Bldg., San Francisco	Almaden
New Almaden Dump	Dave & Ben Black (owners)	Rt. 3, Box 314, Los Gatos	Almaden
<i>Sonoma County</i>			
Culver Baer	C. A. Baumeister	Cloverdale	Cloverdale
Mt. Jackson	Sonoma Quicksilver Mines, Inc.	58 Sutter St., San Francisco	Guerneville
<i>Trinity County</i>			
Altoona	Marsman Co. of California	Russ Bldg., San Francisco	Castella
<i>Yolo County</i>			
Reed	Bradley Mining Co.	Crocker Bldg., San Francisco	Rumsey

\* Took over operations of mine November, 1944.

SALT

Operator	Address	Location of plant
<i>Alameda County</i> American Salt Co., Mrs. Mary Marsicano..... Leslie Salt Co..... Oliver Bros. Salt Co.....	341 Broadway, San Francisco..... 310 Sansome St., San Francisco..... Mt. Eden.....	Mt. Eden Newark and Mt. Eden Mt. Eden
<i>Imperial County</i> Imperial Salt Co.....	1245 National Ave., San Diego.....	Calipatria
<i>Kern County</i> Long Beach Salt Co.....	P.O. Box 28, Long Beach.....	Saltdale
<i>Inyo County</i> Minerals Materials Co., J. W. Dunton, Mgr.....	1145 Westminster Ave., Alhambra.....	Badwater
<i>Los Angeles County</i> Long Beach Salt Co.....	P.O. Box 28, Long Beach.....	Long Beach
<i>Monterey County</i> Monterey Bay Salt Works, E. C. Vierra, Mgr.....	Moss Landing.....	Moss Landing
<i>Orange County</i> The Irvine Co.....	Tustin.....	Tustin
<i>San Bernardino County</i> California Rock-Salt Co..... Desert Chemical Co.....	2465 Hunter St., Los Angeles..... 4031 Goodwin Ave., Los Angeles.....	Amboy Amboy
<i>San Diego County</i> Western Salt Co.....	1245 National Ave., San Diego.....	San Diego

SANDSTONE

Operator	Address	Location of quarry
<i>Monterey County</i> Carmel Stone Quarry, A. L. Possadori..... Andrew Stewart.....	Box 185, Carmel..... Carmel Valley.....	Carmel Carmel

## SILICA

Operator	Product	Address	Location of mine
<i>Contra Costa County</i> Pittsburg Sand Co.	b	87th and G Sts., Oakland	Summerville
<i>Mariposa County</i> The Permanente Metals Corp.	a	Permanente	La Grande
<i>Monterey County</i> Del Monte Properties	b	Del Monte	Pacific Grove
Owens-Illinois Glass Co.	b	135 Stockton St., San Francisco	Pacific Grove
<i>Riverside County</i> P. J. Weisel, Inc.	b	La Habra	Corona
<i>San Bernardino County</i> Gladding, McBean & Co.	a	2901 Los Feliz Blvd., Los Angeles	
Mineral Materials Co., C. W. Dunton, Mgr.	a	1145 Westminster Ave., Alhambra	
Temescal Clay Co.	c	2569 Clarendon Ave., Huntington Park	Victorville

a. Quartz. b. Glass sand. c. Quartzite.

## SILLIMANITE-ANDALUSITE-KYANITE GROUP

Operator	Product	Address	Location of mine
<i>Imperial County</i> Vitrefrax Co.	Kyanite	5050 Pacific St., Vernon, Los Angeles	Ogilby
<i>Mono County</i> Champion Sillimanite, Inc.	Andalusite	Box 117, Laws	Mocalno



SILVER

Principal silver producers in California in 1944 (not less than 2,000 ounces)

Mine	Type of mine	Operators	Address	Post office of mine
<i>Butte County</i>				
Big Bend	o	Hoefling Bros.	Box 786, Sacramento	Oroville
Feather River Channel	h	Golden Feather Dredging Co.	Route 2, Oroville	Oroville
Oroville dredge	e	Oroville Gold Dredging Co.	2052 Bird St., Oroville	Oroville
<i>Calaveras County</i>				
Collier	o	Ernest A. Vogt	101 Palm Drive, Piedmont	Copperopolis
Keystone	j	Keystone Copper Corp.	Copperopolis	Copperopolis
Penn.	o	Eagle Shawmut Mine	Chinese Camp	Chinese Camp
Quail Hill	o	G. Ivan Smith	Copperopolis	Copperopolis
Union	e, j	Pacific Mining Co.	1022 Crocker Bldg., San Francisco	Farmington
<i>Inyo County</i>				
Cerro Gordo	m	Imperial Metals Corp.	Keeler	Keeler
Columbia No. 2	m	Sloshone Mines, Inc.	Tecopa	Tecopa
Darwin	p	Darwin Mines, Arthur J. Theils, Trustee	Darwin	Darwin
Gold Bottom-Ophir	b, p	Damon & Damon	Bin 14, Trona	Trona
Keeler & Last Chance	e, m	L. D. Foreman	850 South 11th West St., Salt Lake City, Utah	Keeler
Pine Creek	n	United States Vanadium Corp.	30 East 12d St., New York, N. Y.	Bishop
<i>Mariposa County</i>				
Blue Moon	o	Red Cloud Mines, Inc.	Wallace, Idaho	Hornitos
<i>Nevada County</i>				
Empire, North Star, et al.	a	Empire Star Mines Co., Ltd.	Box 1027, Grass Valley	Grass Valley
Idaho Maryland-Brunswick	a	Idaho Maryland Mines Corp.	Russ Bldg., San Francisco	Grass Valley
<i>Orange County</i>				
Silverado (Blue Light)	o	Blue Light Silver Mines Co.	508 Chapman Bldg., Fullerton	Fullerton
<i>San Bernardino County</i>				
Copper World	e, j	L. D. Foreman	850 South 14th West St., Salt Lake City, Utah	Cima
Coyote	b	C. O. Mittendorf	Randsburg	Randsburg
Kelly	e, b	Frank W. Royer	Red Mountain	Red Mountain
Mohawk	p	Duntion-Ray & Greenwood	Wheaton Springs via Nipton	Nipton
<i>Shasta County</i>				
Hornet	s	The Mountain Copper Co.	216 Pine St., San Francisco	Matheson
	e, p	Clayton T. McNeil and C. Erb Wuensch	Summit City	Summit City
<i>Siskiyou County</i>				
Dakin (Gray Eagle)	j	Gray Eagle Copper Co.	Happy Camp	Happy Camp

a. Lode gold mine. b. Gold-silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucketline). f. Drift mine. g. Hydraulic mine. h. Dragline operations. i. Copper-gold mine. k. Power shovel or dryland dredge. m. Lead mine. n. Suction dredge. o. Zinc mine. p. Silver-lead-zinc. r. Tungsten mine. s. Copper-zinc mine. t. Gravel plant.

## SLATE

Operator	Product	Address	Location of quarry
<i>El Dorado County</i> Pacific Minerals Co., Ltd.	b, c	337 10th St., Richmond	Chili Bar

b. Granules. c. Crude.

## SOAPSTONE AND TALC

Operator	Product	Address	Location of mine
<i>Amador County</i> Amador Products Co.	a	Pine Grove	Pine Grove
<i>Inyo County</i> Blue Star Mines, Ltd.	b	810 S. Spring St., Los Angeles	Kingston Mountain
Desert Talc & Clay Co.	b	Pomona	Keeler
Sierra Talc Co.	b	724 S. Spring St., Los Angeles 14	Keeler
Viking Talc Mine, Franko Western Oil Co.	b	601 Edison Bldg., Los Angeles	Keeler
White Mountain Talc Co., Wm. M. Bonham	b	Lone Pine	Lone Pine
<i>Mono County</i> Huntly Mines	c	Bishop	Laws
<i>San Bernardino County</i> Monarch Talc Mines	b	649 S. Olive St., Los Angeles	Shoshone
Muroc Clay Co.	b	5525 Randolph St., Los Angeles 22	Shoshone
Sierra Talc Co.	b	724 S. Spring St., Los Angeles	Silver Lake
Southern Calif. Minerals Co., W. S. Skeoch	b	320 Mission Rd., Los Angeles	Kingston Mountain
Western Talc Co.	b	1901 E. Slauson Ave., Los Angeles	Death Valley
<i>Tuolumne County</i> Walter C. Sundburg	a	Box 653, Sonora	Sonora

a. Soapstone. b. Talc. c. Pyrophyllite.

SODA

Operator	Product	Address	Location of plant
<i>Inyo County</i> Natural Soda Products Co.----- Pittsburgh Plate Glass Co., Columbia Chemical Division.-----	a, d a, d	405 Montgomery St., San Francisco----- 523 W. 6th St., Los Angeles-----	Keeler Bartlett
<i>San Bernardino County</i> American Potash & Chemical Co.----- Desert Chemical Co.----- West End Chemical Co.-----	a, c c a	Trona----- 4031 Goodwin Ave., Los Angeles----- Latham Square Bldg., Oakland-----	Trona Amboy West End

a. Soda ash c. Salt cake. d. Trona.

STONE, MISCELLANEOUS

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

NOTE.—The California State Highway Commission, the various counties, U. S. Forest Service and U. S. Bureau of Public Roads produce both crushed rock and sand and gravel in various places in the State used in construction and maintenance of highways, but not specified in this listing.

Operator	Product	Address	Location of pit or quarry
<i>Alameda County</i> Ariss-Knapp Co.----- Louis Angelus----- California Rock & Gravel Co.----- J. Caucci----- Healey-Moore Co., Leona Quarry----- Henry J. Kuiser Co.----- Kemper Bros.----- Leslie Salt Co.----- J. L. Martin----- Pacific Coast Aggregates, Inc.----- Thos. B. Russell Quarry, T. B. Russell----- Superior Rock Co.-----	b b a b b a, b b b b a, b b b	961 41st St., Oakland----- 18 Dutton Ave., San Leandro----- 1800 Hobart Bldg., San Francisco----- 1212 18th Ave., Oakland----- 344 High St., Oakland----- 1522 Latham Square Bldg., Oakland----- 5998 Strabridge Ave., Hayward----- 310 Sansome St., San Francisco----- 5921 Shepherd Canyon Rd., Oakland----- 85 2d St., San Francisco----- 1192 Russell Way, Hayward----- Broadway and McAdams St., Oakland-----	Oakland Oakland Livermore Oakland Oakland Radium Hayward Newark Oakland Elhot and Niles Hayward Oakland
<i>Amador County</i> Plymouth Rock Wool Mfg. Co.-----	e	1903 Capitol Ave., Sacramento-----	Plymouth

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, rip-rap, etc.). c. Molding sand. d. Granules for roofing, terrazzo. c. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

## STONE, MISCELLANEOUS—Continued

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
<i>Butte County</i> Bechtel-Kaiser Rock Co., R. J. Kennedy, Mgr. Pacific Coast Aggregates, Inc.	a, b a	1522 Latham Square Bldg., Oakland 85 2d St., San Francisco	Oroville
<i>Calaveras County</i> Nelsen Gravel Plant, R. Nelsen	a	Box 14, San Andreas	San Andreas
<i>Contra Costa County</i> Antioch Asphalt Co. Atchison, Topeka & Santa Fe Railway Co. Basalt Rock Co. Blake Bros., Anson Blake Henry J. Kaiser Co. Morris Sand Pit, Ben Morris The Roberts Bros.	a g a b a, b a c	Claremont Hotel, Berkeley 5 560 S. Main St., Los Angeles 13 8th St., Napa Box 1002, Richmond 1522 Latham Square Bldg., Oakland Antioch Pittsburg	Antioch Antioch Point Richmond Antioch and Upton Antioch Clayton
<i>El Dorado County</i> Diamond Springs Lime Co.	b	Diamond Springs	Diamond Springs
<i>Fresno County</i> Atchison, Topeka & Santa Fe Railway Co. Central Rock & Sand Co. Grant-Pacific Rock Co. Herndon Rock Products Co. Southern California Edison Co.	a a, b a, b a, b a	560 S. Main St., Los Angeles 13 Sanger Box 649, Fresno 410 Thorne St., Fresno Edison Bldg., Los Angeles	Sanger El Prado Herndon
<i>Glenn County</i> E. B. Bishop Southern Pacific Co.	a a	Box 325, Orland 65 Market St., San Francisco	Wyo Wyo
<i>Humboldt County</i> Tom Hull Mercer Fraser Co., Essex & Fernbridge Northwestern Pacific R.R. Co., Wm. N. Neff, Gen. Sup't.	a a a	Eureka 2d and Commercial Sts., Eureka Sausalito	Eureka Eureka Sequoia
<i>Imperial County</i> Donald Cowan Inland Materials Co. Nixon Pipe Yard	a a a	El Centro El Centro Rt. 2, Box 268, El Centro	El Centro El Centro Seeley

<i>Kern County</i> Bakersfield Rock and Gravel Co..... Griffith Co..... Kern Rock Co., Ltd.....	a a b	Box 395, Station A, Bakersfield Bakersfield Box 1697, Bakersfield	Bakersfield Bakersfield Kern River
<i>Lassen County</i> Red River Lumber Co.....	a	Westwood	Westwood
<i>Los Angeles County</i> Arrow Rock Co..... A. T. & S. F. R.R., I. L. Hibbard, Gen. Mgr..... Guy F. Atkinson Co.....	a a b	Box 155, Monrovia 609 Kerekhoff Bldg., Los Angeles 1103 Heartwell Bldg., Long Beach 2	Monrovia Forbes Santa Catalina Island, Long Point
Azusa Rock & Sand Co..... Richard R. Ball..... Blue Diamond Corp., Ltd..... Wm. J. Bonfield..... Chandler Palos Verdes Sand & Gravel, L. Chandler..... Consolidated Rock Produce Co.....	a, b a a g a a, b	Rural Delivery, Azusa Box 96, Walteria 1650 S. Alameda St., Los Angeles 2908 Laurel Canyon Rd., Los Angeles Lomita Box 2950 Terminal Annex or 2730 S. Alameda St., Los Angeles	Azusa Walteria El Monte and Roscoe Hollywood Lomita Los Angeles, Azusa, Ros- coe and Monrovia
Eaton Canyon Rock & Sand Co..... W. F. Glaser, Inc..... Graham Bros..... Granite Material Co..... John D. Gregg..... Lindaner Corp..... Los Angeles Decomposed Granite Co..... Manning Bros. Rock & Sand Co..... Mission Rock & Sand Co..... Owl Rock Products Co..... Pacific Rock & Gravel Co..... Edwin Sidebotham & Sons, Inc., Sidebotham Sand Plant.....	a, b b a, b a, g a, b a g a, b a, b a, b, g a, b a	Box 95, East Pasadena 713 N. Sepulveda, Brentwood Heights, Los Angeles 4731 E. 52d Drive, Los Angeles 8200 Tujunga Ave., Roscoe Box 110, Whittier Box 208, La Habra 2171 W. Washington, Los Angeles Irwindale 1172 La Presa Drive, San Gabriel P.O. Box 509, Monrovia 800 Lane Mortgage Bldg., 208 W. 8th St., Los Angeles McFarland and L Sts., Wilmington	Pasadena Brentwood Heights El Monte and Roscoe Roscoe Whittier La Habra Los Angeles Irwindale San Gabriel Monrovia Lomita
<i>Marin County</i> Hutchinson Co..... Marin Gravel Co.....	b a	Box 156, El Cerrito Point Reyes	San Quentin Point Reyes
<i>Mariposa County</i> Yosemite National Park.....	a	Yosemite	Yosemite Nat'l Park
<i>Mendocino County</i> John Freitas.....	a	Ukiah	Ukiah
<i>Merced County</i> Bair Creek Sand and Gravel Co., J. W. Huffman..... J. C. Halbert..... Los Banos Gravel Co..... Standard Materials.....	b a a a	Merced Winton R.F.D., Box 22 1411 9th St., Modesto	Winton Los Banos Gustine

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, rip-rap, etc.). c. Molding sand. d. Granules for roofing, terrazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

granite.

## STONE, MISCELLANEOUS—Continued

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

<i>Modoc County</i>					
E. B. Bishop.....	b	Box 325, Orland.....	Adin		
Great Northern Railway, T. A. Jerrow, Supt.....	c	Klamath Falls, Ore.....	Mammoth		
Moyer Gravel Co.....	a	P.O. Box 25, Alturas.....	Alturas		
<i>Monterey County</i>					
Del Monte Properties, C. S. Olmsted.....	a, c	Del Monte.....	Del Monte		
Monterey Sands, H. A. Gowman.....	a	46 W. Alisal St., Salinas.....			
M. J. Murphy.....	a, b	Monte Verde and 9th Sts., Carmel.....	Carmel		
Pacific Coast Aggregates, Inc.....	a	85 2d St., San Francisco.....	Lapis and Pratteo		
<i>Napa County</i>					
Basalt Rock Co.....	b	8th St., Napa.....	Napa		
Juarez Quarry, M. G. Reidenbach.....	b	Napa.....	Napa		
<i>Orange County</i>					
Geo. T. Calhoun.....	a	P.O. Box 1741, Santa Ana.....	Garden Grove		
California Rock Co.....	a	Rural Delivery, Orange.....	Orange		
Consolidated Rock Products Co.....	a, b	2730 S. Alameda St., Los Angeles.....	Fullerton and Orange		
Fowler Sand & Gravel Co.....	a	Rt. 1, Box 19-A, Orange.....	Santa Ana		
V. J. Frye Foundry Supplies.....	c	1302 N. Flower St., Santa Ana.....	Santa Ana		
Graham Bros.....	a	4731 E. 52d Drive, Los Angeles.....	San Juan Capistrano		
<i>Placer County</i>					
Roseville Sand Co.....	a	Box 531, Roseville.....	Roseville		
Union Granite Co., Ruhkala Bros.....	b	Rocklin.....	Rocklin		
<i>Riverside County</i>					
Ace Grading Co.....	b	5965 Crenshaw Blvd., Los Angeles.....	Blythe		
Guy F. Atkinson Co.....	b	1103 Heartwell Bldg., Long Beach.....	Bly Junction		
A. T. & S. F. R.R. Co., I. L. Hibbard, Gen. Mgr.....	b	609 Kerckhoff Bldg., Los Angeles.....	Box Springs		
Emil Johnson.....	b	Perris.....	Perris		
San Geronio Rock Co.....	a, b	Banning.....	Banning		
Service Rock Co.....	a	Box 309, Riverside.....	Riverside		
Transit Mixed Concrete Co.....	a, b	3464 E. Foothill Blvd., Pasadena.....	Corona		
P. J. Weisel, Industrial Sands.....	a, c, h	La Habra.....	Corona		
<i>Sacramento County</i>					
Brighton Sand & Gravel Co.....	a, b	P.O. Box 2604, Sacramento.....	Sacramento		
Canon & Co.....	c	Box 281, Sacramento.....	Ben Ali		
Del Paso Rock Products Co.....	a, b	Rt. 5, Box 1200, Sacramento.....	Del Paso		
Fair Oaks Gravel Co.....	a	Illinois Ave., Fair Oaks.....	Fair Oaks		
Haggins Gravel Co.....	a	P.O. Box 812, Sacramento 4.....	Sacramento		
Lord & Bishop.....	b	P.O. Box 812, Sacramento 4.....	Sacramento		
Mueke Sand & Gravel Co.....	a	1433 57th St., Sacramento.....	Mayhew		
Pacific Coast Aggregates, Inc.....	a, b	85 2d St., San Francisco.....	Fair Oaks, Mayhew and American River		

Perkins Gravel Co.	a, b	Perkins	Perkins
Robert Powell & Co.	a	Box 815, Sacramento	American River
<i>San Benito County</i>			
Granite Rock Co.	b	Drawer M, Watsonville	Logan
<i>San Bernardino County</i>			
A. T. & S. F. R.R.	a	600 Kerekhoff Bldg., Los Angeles	Gale
Concrete Rock & Sand Co.	a	P.O. Box 149, Colton	Colton
Consolidated Rock Products Co.	a, b	2730 S. Alameda St., Los Angeles	Claremont
Geo. Herz & Co.	a	Base Line & Lytle Sts., San Bernardino	San Bernardino
Holiday Rock Co.	a, b	Upland	Upland
Johnson Fourth Street Rock Crusher	a, b	305 Lytle St., San Bernardino	San Bernardino
Palm Springs Builders' Supply Co.	a, b	682 S. Palm Canyon Drive, Palm Springs	Palm Springs
Redlands Gravel Co.	a	Redlands	Redlands
San Bernardino Rock & Gravel Co.	a	Box 249, San Bernardino	San Bernardino
Triangle Rock & Gravel Co.	a	San Bernardino	San Bernardino
Union Pacific Railroad Co.	a	2025 Hunter St., Los Angeles	
<i>San Diego County</i>			
Calaveras Materials Co.	b	Oceanside	Oceanside
Canyon Rock Co.	a, b	Box F, Hillcrest Sta., San Diego	San Diego
Claudell & Johnson	a	Box 246, Hillcrest Sta., San Diego	Mission Valley
Crystal Silica Co.	a, c, h	717 E. 61st St., Los Angeles	Oceanside
Escondido Sand & Gravel Works	a	Escondido	Escondido
H. G. Fenton Materials Co.	a	13th and Imperial Ave., San Diego	San Diego
H. M. Hubbard	c	2700 Barnson Pl., San Diego, P.O. Box 381	San Diego
John T. Momand	f	Carlsbad	Carlsbad
Nelson & Sloan	a	Box 832, Chula Vista	Chula Vista
Oceanside Rock & Sand Co.	a	Oceanside	Oceanside
<i>San Francisco County</i>			
Mission Quarry Co.	b	210 Balboa Bldg., San Francisco	San Francisco
<i>San Joaquin County</i>			
Frank B. Marks & Sons	a, b	Newman	Newman
Mokelumne Sand & Gravel Co., D. M. Dyer	a	527 E. Lodi Ave., Lodi	Lodi
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Riverbank
Santa Fe Sand & Gravel Co., W. A. Arington	a	Box 271, Escalon	Escalon
Elmer J. Warner	a	1103 Sycamore St., Stockton	
<i>San Luis Obispo County</i>			
Guiton Molding Sand, Harold E. Guiton	a	Oceano	Oceano
Walter B. Roselip	a, b	615 Grand Ave., San Luis Obispo	Atascadero

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, rip-rap, etc.). c. Molding sand. d. Granules for roofing, terrazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite. h. Filter and blast sand.

## STONE, MISCELLANEOUS—Continued

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
<i>San Mateo County</i>			
Brumley-Donaldson Co.	c	Rialto Bldg., San Francisco	South San Francisco
Canadas Quarry, California Paving Co.	b	1406 3d Ave., San Mateo	Half Moon Bay
Industrial Mineral Products, J. W. Jessiman	c	230 7th Ave., San Francisco	South San Francisco
Golden West Quarry	b	4277 Mission St., San Francisco	Daly City
Holy Cross Cemetery	b	Colma	Colma
Rockaway Quarry, Inc.	a, b	1111 Mills Tower, San Francisco	Rockaway Beach
Shoreland Co.	b	Pescadero	Pescadero
<i>Santa Barbara County</i>			
Gates Gravel Plant, Frank H. Gates	a	Santa Maria	Sisquoc
Miller Bros. Truck Co.	c	10424 Washington Ave., South Gate	
Henry G. Petersen, d.b.a. Buell Flat Rock Co.	b	Solvang	Solvang
Southern Pacific R.R. Co., Ass't Chief Engineer	b	Southern Pacific Bldg., San Francisco	Arlight
<i>Santa Clara County</i>			
Los Gatos Sand and Gravel Co.	a	Los Gatos	Los Gatos
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Coyote and Campbell
Permanente Cement Co.	b	Permanente	Permanente
Rhodes & Robinson, Stanford Quarry	b	Box 325, Palo Alto	Palo Alto
Western Gravel Corp.	a	Box 855, Campbell	Campbell
<i>Santa Cruz County</i>			
Henry J. Kaiser Co.	a	1522 Latham Square Bldg., Oakland	Olympia
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Olympia
<i>Shasta County</i>			
Columbia Construction Co., Henry J. Kaiser Co.	a	Latham Square Bldg., Oakland	Cottonwood
Diestelhorst Gravel Plant, Chas. Diestelhorst, Jr.	a, b	1078 West St., Redding	Redding
Hein Bros. Basalt Rock Co.	a	Petaluma	Redding
City of Redding	a, b	Redding	Redding
Southern Pacific R.R. Co., Ass't Chief Engineer	e	Southern Pacific Bldg., San Francisco	Kennett
<i>Siskiyou County</i>			
James M. Baker, Jr.	c	Klamath Falls, Oregon	Mt. Shasta
A. E. Kottfinger	a	Mt. Shasta	Kegg
Southern Pacific R.R. Co., Ass't Chief Engineer	e	Southern Pacific Bldg., San Francisco	Yreka
A. Young	b	345 N. Main St., Yreka	



<i>Solano County</i> J. M. Nelson, Cordelia Quarry Red Rock Quarry, Ltd.	b b	Cordelia Box 671, Vallejo.	Cordelia Vallejo
<i>Sonoma County</i> Basalt Rock Co. Hein Bros. Basalt Rock Co., Mark Hein, Pres. John C. Spaletta Stony Point Quarry, W. A. Wilson.	a b a b	8th St., Napa. Petaluma Montgomery Dr., Santa Rosa Petaluma, Star Route.	Healdsburg Petaluma Santa Rosa Stony Point
<i>Stanislaus County</i> Tony Francisco. Gravel Products Co. Wes Haslan. Hughson Gravel Co. Frank B. Marks & Sons. Oakdale Irrigation Dist. Putnam Sand & Gravel Co. J. P. Scanlon, Scanlon Gravel Pit. Chas. Warner.	a a a, b a a a a a a	Crows Landing. Hughson Oakdale. 301 N. Santa Cruz Ave., Modesto. Newman Oakdale. Box 486, Modesto. Patterson. Modesto.	Crows Landing Hughson Oakdale Hughson Newman Oakdale Modesto Crows Landing Modesto
<i>Trinity County</i> Northwestern Pacific R.R. Co., Wm. N. Neff, Gen. Sup't.	b	Sausalito.	Island Mountain
<i>Tulare County</i> Dimuba Cement Co. Grant-Pacific Rock Co. O. C. Jeffers.	a a, b a	Dimuba P.O. Box 649, Fresno. 1032 River Rd., Porterville.	Dimuba Lindsay Porterville
<i>Tuolumne County</i> Beerman & Jones.	b	Sonora.	Soulsbyville
<i>Ventura County</i> Montalvo Rock Co. Santa Paula Rock Co. Saticoy Rock Products Co. Ventura Molding Sand Co., O. D. Messmore.	a, b a, b a, b c	Box 188, Montalvo. Box 671, Santa Paula Box 970, Ventura 182 W. Simpson St., Ventura.	Montalvo Santa Paula Saticoy-Ventura Ventura
<i>Yolo County</i> Leroy Kerr. Joe Schwarzgruber George Summers Yolo Gravel Co.	a a a a	Yolo. Woodland Woodland Box 98, Yolo.	Yolo Woodland Woodland Yolo
<i>Yuba County</i> Henstreet & Bell. Pacific Coast Aggregates, Inc. Yuba River Sand Co.	a, b a a	501 11th St., Marysville. 85 2d St., San Francisco. Marysville.	Marysville Marysville Marysville

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, rip-rap, etc.). c. Molding sand. d. Granules for roofing, terrazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

STRONTIUM

Operator	Address	Location of mine
<i>Imperial County</i> Pan-Chemical Co., John A. Stevens-----	1396 N. Harvard St., Claremont-----	Fish Mts.
<i>San Bernardino County</i> Rowe-Buehler Mining Co., Wesley N. Rowe-----	919 E. Valley Blvd., Rosemead-----	Lavie

TITANIUM

Operator	Address	Location of mine
<i>Los Angeles County</i> Mrs. Harvey R. Smith-----	421 S. Harvard Blvd., Los Angeles-----	Hermosa Beach

Mine	Operator	Address	Location of mine
<i>Fresno County</i>			
Garnet.....	P. G. Armstrong, et al.....	Auberry.....	Auberry
Garnet Dyke.....	Sheridan, Bennett, & Kidder.....	Kings River Hatchery.....	Kings River
Kings River.....	B. Bazuk.....	717 Voorman, Fresno.....	Kings River
Kings River Mines.....	Kings River Mines, L. O. Gillice.....	600 Rowell Bldg., Fresno.....	Kings River
	Consolidated Tungsten.....	Box 366, Dinuba.....	Drum Valley
<i>Inyo County</i>			
Bacool.....	Twin Pines Mining & Milling Co.....	6331 Hollywood Blvd., Hollywood.....	Big Pine
Durlam, Fernando & St. Charles.....	Pacific Tungsten Co.....	9730 Wilshire Blvd., Beverly Hills.....	Darwin
Hill Peak.....	U. S. Flare Corp., Mining Division.....	650 S. Grand Ave., Los Angeles.....	Inyokern
Larbert.....	Kenneth G. Irons.....	Box 845, Bishop.....	Bishop
Marble.....	A. H. Peterson & John Utter.....	Bishop.....	Bishop
Panaminas.....	Panaminas, Inc., Geo. W. Mitchell, Mgr.....	Box 417, Bishop.....	Bishop
Papas & Schober.....	El Diablo Mining Co., H. O. Johanson, Mgr.....	Box 567, Bishop.....	Tungsten City
Pine Creek.....	United States Vanadium Corp.....	30 East 42d St., New York, N. Y.....	Bishop
Round Valley.....	Round Valley Minerals Recovery Co., N. C. Aldo.....	Rt. 1, Bishop.....	Bishop
Tungstar.....	Tungstar Corp., P. N. Stevens.....	6233 Hollywood Blvd., Los Angeles.....	Bishop
<i>Kern County</i>			
Bluebird.....	L. J. Sain.....	Box 342, Randsburg.....	Randsburg
Donlevy.....	Donlevy Development Co.....	242 N. Canon Dr., Beverly Hills.....	Piute Mts.
	Beebe Mining & Milling Co.....	1807 N. Lima St., Burbank.....	Isabella
	M. J. Gusty.....	Bodfish.....	Havilah
<i>Mono County</i>			
Black Rock.....	A. E., S. H. & John Beauregard.....	Bishop.....	Benton
Scheelore.....	H. A. Van Loon.....	Bishop.....	McGee Creek
<i>Nevada County</i>			
North Star.....	New Verde Mines Co.....	Grass Valley.....	Grass Valley
<i>San Bernardino County</i>			
Atolia.....	Atolia Mining Co.....	1022 Crocker Bldg., San Francisco.....	Atolia
Gold Basin.....	Clarence A. Baker.....	Red Mountain.....	Red Mountain
Hidden Value.....	L. J. Rouchieau.....	2700 Budlong St., Los Angeles.....	Danby
Spud Patch Placers & Atolia.....	Hoelling Bros.....	1820 E St., Sacramento.....	Atolia
	Austin Lands.....	Randsburg.....	Randsburg
<i>Tulare County</i>			
Herberts.....	Herberts Mines.....	Rt. 5, Box 150 A, Porterville.....	Porterville
Will Gill Ranch.....	Tulare Co. Tungsten Mines.....	1855 Industrial St., Los Angeles.....	Lindsay
Yokohl Valley.....	Yokohl Valley Tungsten Mining Co.....	Box 36, Dunlap.....	Dunlap

## ZINC

Principal zinc producers in California in 1944 (not less than 10,000 pounds)

Mine	Operator	Address	Post office of mine
<i>Butte County</i> Big Bend	Hoefling Bros.	Box 786, Sacramento	Oroville
<i>Calaveras County</i> Collier	Ernest Vogt	101 Palm Dr., Piedmont	Copperopolis
Penn	Eagle Shawmut Mine	Chinese Camp	Chinese Camp
Quail Hill	G. Ivan Smith	Copperopolis	Copperopolis
<i>Inyo County</i> Big Four	Silas Ness	Panamint Springs	Panamint Springs
Columbia No. 2	Shoshone Mines, Inc.	Tecopa	Tecopa
Darwin Group	Darwin Mines, Arthur J. Theis, Trustee	Darwin	Darwin
Gold Bottom-Ophir	Damon & Damon	Bin 14, Trona	Trona
Honolulu-Big Horn (Gibraltar)	Southwest Lead & Zinc Co.	433 S. Spring St., Los Angeles	Ballarat
<i>Mariposa County</i> Blue Moon	Red Cloud Mines, Inc.	Wallace, Idaho	Hornitos
<i>Orange County</i> Silverado	Blue Light Silver Mines Co.	508 Chapman Bldg., Fullerton	Fullerton
<i>San Bernardino County</i> Lady Luck	James A. Boland	Cima	Cima
Mohawk	Dunton-Ray & Greenwood	Wheaton Springs via Nipton	Nipton
Sagamore	California Sulphur Co.	Ivanpah	Ivanpah
<i>Shasta County</i> Hornet	The Mountain Copper Co.	216 Pine St., San Francisco	Matheson
	Clayton T. McNeil and C. E. Wuensch	Summit City	Summit City

SMELTERS, CUSTOM MILLS, ORE AND METAL BUYERS

Reporting Purchase of California Metals (except Gold and Silver) Produced in 1944

Name	Address	Location of plant	Metals reported purchased
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Garfield, Utah	Copper, Lead
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Hayden, Ariz.	Copper
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Murray, Utah	Lead, Copper
American Smelting & Ref. Co.	405 Montgomery St., San Francisco	Selly, Calif.	Copper, Lead
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Tacoma, Wash.	Copper, Lead
Anaconda Copper Mining Co.	25 Broadway, New York 4, N. Y.	Great Falls, Mont.	Copper, Lead, Zinc
C. L. Aeh	1855 Industrial St., Los Angeles	Los Angeles	Tungsten
Bradley & Ekstrom	320 Market St., San Francisco	San Francisco	Chromite, Manganese, Iron
Coast Chemical Division F. W. Berk & Co., Inc.	Sharon Bldg., San Francisco	San Francisco	Quicksilver
H. W. Gould & Co.	Mills Bldg., San Francisco	San Francisco	Quicksilver
The Harshaw Chemical Co.	Box 37, El Segundo	El Segundo	Antimony and Quicksilver
International Smelting & Ref. Co.	Tooele, Utah	Tooele, Utah	Copper, Lead, Zinc
Kaiser Co., Inc.	P.O. Box 217, Fontana	Fontana	Iron Ore, Manganese Ore, Chrome
Mefford Chemical Co.	1026 Santa Fe, Los Angeles	Los Angeles	Quicksilver
Metals Reserve Co.	Washington, D. C.	Various stock piles	Chronite, Manganese Ore, Ore, Tin, Antimony
Pacific Vegetable Oil Co., Bernard T. Rocca	62 Townsend St., San Francisco	San Francisco	Quicksilver
Quicksilver Producers Ass'n, Irving Ballard, Sec'y	407 Sansome St., San Francisco	San Francisco	Quicksilver
Aaron J. Smith	P.O. Box 77, Bishop	Bishop	Tungsten Ore
Sullivan Mining Co.	Kellogg, Idaho	Silver King, Idaho	Copper, Lead, Zinc, Cadmium
U. S. Smelting, Refining & Mining Co.	Newhouse Bldg., Salt Lake City, Utah	Midvale, Utah	Copper, Lead, Zinc
West Coast Tungsten Co.	9730 Wilshire Blvd., Beverly Hills	Darwin	Tungsten
Western Gold & Platinum Works	580 Bryant St., San Francisco	San Francisco	Platinum
Wildberg Bros. Smelting & Ref. Co.	742 Market St., San Francisco	San Francisco	Platinum



## APPENDIX

## PUBLIC RESOURCES CODE

An act to establish a Public Resources Code, thereby consolidating and revising the law relating to natural resources, the conservation, utilization, and supervision thereof, and matters incidental thereto, and to repeal certain acts and parts of acts specified herein.

Chapter 93 (Stats. 1939.)

*The people of the State of California do enact as follows:*

## GENERAL PROVISIONS

1. This act shall be known as the Public Resources Code.
2. The provisions of this code, in so far as they are substantially the same as existing provisions relating to the same subject matter shall be construed as restatements and continuations thereof and not as new enactments.
3. All persons who, at the time this code goes into effect, hold office under any of the acts repealed by this code, which offices are continued by this code, continue to hold the same according to the former tenure thereof.
4. No action or proceeding commenced before this code takes effect, and no right accrued, is affected by the provisions of this code, but all procedure thereafter taken therein shall conform to the provisions of this code so far as possible.
5. Unless the context otherwise requires, the general provisions hereinafter set forth shall govern the construction of this code.
6. Division, part, chapter, article, and section headings contained herein shall not be deemed to govern, limit, modify or in any manner affect the scope, meaning, or intent of the provisions of any division, part, chapter, article, or section hereof.
7. Whenever, by the provisions of this code, an administrative power is granted to a public officer or a duty imposed upon such officer, the power may be exercised or the duty performed by a deputy of the officer or by a person authorized pursuant to law.
8. Writing includes any form of recorded message capable of comprehension by ordinary visual means. Whenever any notice, report, statement or record is required by this code, it shall be made in writing in the English language.
9. Whenever any reference is made to any portion of this code or of any other law of this State, such reference shall apply to all amendments and additions thereto now or hereafter made.
10. "Section" means a section of this code unless some other statute is specifically mentioned.
11. The present tense includes the past and future tenses; and the future the present.
12. The masculine gender includes the feminine and neuter.
13. The singular number includes the plural, and the plural the singular.
14. "County" includes "city and county."
15. "Shall" is mandatory and "may" is permissive.
16. "Oath" includes affirmation.
17. "Signature" or "subscription" includes mark when the signer or subscriber can not write, such signer's or subscriber's name being written near the mark by a witness who writes his own name near the signer's or subscriber's name; but a signature or subscription by mark can be acknowledged or can serve as a signature or subscription to a sworn statement only when two witnesses so sign their own names thereto.
18. If any provision of this code, or the application thereof to any person or circumstances, is held invalid the remainder of the code, and the application of its provisions to the other persons or circumstances, shall not be affected thereby.

## DIVISION 1. THE DEPARTMENT OF NATURAL RESOURCES

501. There is in the State government a Department of Natural Resources. The department shall be conducted under the control of an executive officer known as the Director of Natural Resources. The director shall be appointed by and hold office at the pleasure of the Governor and shall receive a salary of six thousand dollars a year.

502. Except as in this division otherwise provided, the provisions of Article 2, Chapter 3, Title 1, Part 3 of the Political Code shall govern and apply to the conduct of the Department of Natural Resources in every respect the same as if such provisions were herein set forth at length, and wherever in that article the term "head of the department" or similar designation occurs, it shall for the purposes of this division mean the Director of Natural Resources.

503. For the purposes of administration the department shall be organized by the director, subject to the approval of the Governor, in such manner as he deems necessary properly to segregate and conduct the work of the department. The director may appoint, in accordance with the civil service and other provisions of law, such deputies, officers, and other expert and clerical assistants as may be necessary.

504. The work of the department shall be divided into at least four divisions, known as Division of Forestry, the Division of Parks, The Division of Fish and Game, and The Division of Mines.

505. The Division of Forestry shall be administered through a chief who shall be known as the State Forester. He shall be a technically trained forester, appointed by the director upon nomination by the State Board of Forestry. General policies for the guidance of the Division of Forestry shall be determined by a State Board of Forestry which shall consist of seven members appointed by and holding office at the pleasure of the Governor. Of the seven members one shall be familiar with the pine timber industry, one with the redwood industry, one with live stock industry, one with general agriculture, and one with the problems of water conservation.

506. The Division of Parks shall be administered through a chief who shall be appointed by the director upon nomination by the State Park Commission. General policies for the administration of the State park system shall be determined by the State Park Commission which shall consist of five members appointed by and holding office at the pleasure of the Governor.

507. The Division of Minerals shall be administered through a chief who shall be known as the State Mineralogist. He shall be a technically trained mining engineer, appointed by the director upon nomination by the State Mining Board. General policies for the guidance of the Division of Mines shall be determined by a State Mining Board, which shall consist of five members appointed by and holding office at the pleasure of the Governor.

508. The Division of the Department of Natural Resources for the supervision of oil and gas shall be in charge of a chief, known as the State Oil and Gas Supervisor.

509. The salaries of the chiefs of the Divisions of Forestry and Parks shall be fixed by the director with the approval of the Governor. The director and the chief of each division, before entering upon his duties, shall execute and deliver to the State an official bond in the sum of twenty-five thousand dollars conditioned upon the faithful performance of his duties.

510. The members of the Board of Forestry and the State Park Commission shall serve without compensation, but shall be entitled to their actual necessary expenses incurred in the performance of their duties.

512. The Department of Natural Resources may expend the money in any appropriation or in any special fund in the State treasury made available by law for the administration of the statutes the administration of which is committed to the department, or for the use, support, or maintenance of any board, bureau, commission, department, office, or officer whose duties, powers, and functions have been transferred to and conferred upon the department. Such expenditures by the department shall be made in accordance with law in carrying out the purposes for which the appropriations were made or the special funds created.

513. The department shall have possession and control of all records, books, papers, offices, equipment, supplies, moneys, funds, appropriations, land and other



property, real or personal held for the benefit or use of all bodies, offices, and officers whose duties, powers, and functions have been transferred to and conferred upon the department.

514. Nothing in this code is intended to supersede, modify or change the effect of the enactment of section 373g of the Political Code, and wherever in this code reference is made to any officer or agency of the Department of Natural Resources, it is made in the sense and with the same legal effect as was attributable thereto in the statute whence derived and which would continue to be so attributable but for the adoption of this code.

## DIVISION 2. MINES AND MINING

### CHAPTER 1. DEFINITIONS

2001. Unless the context otherwise requires, the definitions hereinafter set forth shall govern the construction of Division 2 of this code.

2002. "Department" in reference to the government of this State, means the Department of Natural Resources.

2003. "Division" in reference to the government of this State, means the Division of Mines in the Department of Natural Resources.

2004. "Person" includes any individual, firm, association, corporation, or any other group or combination acting as a unit.

### CHAPTER 2. THE DIVISION OF MINES

2200. For the purposes of this chapter "mine" includes all mineral bearing properties of whatever kind or character, whether underground, quarry, pit, well, spring or other source from which any mineral substance is or may be obtained. "Mineral" for the purposes of this chapter includes all mineral products both metallic and nonmetallic, solid, liquid or gaseous, and mineral waters of whatever kind or character.

2201. The State Mineralogist shall employ competent geologists, field assistants, qualified specialists, and office employees when necessary in the execution of the plans and operations of the division under this chapter and shall fix their compensation.

2202. The State Mineralogist shall maintain offices, and a museum, library, and laboratory in San Francisco for the purposes provided in this chapter.

2203. The State Mineralogist shall make a biennial report to the Governor on or before the fifteenth day of September next preceding the regular session of the Legislature.

2204. The State Mineralogist may receive on behalf of this State, for the use and benefit of the division, gifts, bequests, devices, and legacies of real or other property and may use the same in accordance with the wishes of the donors. If no instructions are given by the donors, the State Mineralogist shall manage, use, and dispose of the gifts, bequests, and legacies for the best interests of the division and in such manner as he may deem proper.

2205. The State Mineralogist shall:

(a) Make, facilitate, and encourage special studies of the mineral resources and mineral industries of the State.

(b) Collect statistics concerning the occurrence and production of the economically important minerals and the methods pursued in making their valuable constituents available for commercial use.

(c) Make a collection of typical geological and mineralogical specimens, especially those of economic and commercial importance such collection constituting the museum of the division.

(d) Provide a library of books, reports, and drawings bearing upon the mineral industries, the sciences of mineralogy and geology, and the arts of mining and metallurgy, such library constituting the library of the division.

(e) Make a collection of models, drawings, and descriptions of the mechanical appliances used in mining and metallurgical processes.

(f) Preserve and so maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours.

(g) Maintain, in effect, a bureau of information concerning the mineral industry of this State to consist of such collections and library, and arrange, classify, catalogue, and index the data therein contained, in a manner to make the information available to those desiring it.

(h) Issue from time to time such bulletins as he may deem advisable concerning the statistics and technology of the mineral industries of this State.

2206. The State Mineralogist may prepare a special collection of ores and minerals of California to be sent to or used at any world's fair or exposition in order to display the mineral wealth of the State.

2207. The owner, lessor, lessee, agent, manager, or other person in charge of any mine of whatever kind or character within the State shall forward to the State Mineralogist, upon his request, at his office, not later than the thirty-first day of March in each year, a detailed report upon forms which will be furnished showing the character of the mine, the number of men employed, the method of working the mine and the general condition thereof, and the total mineral production for the past year. He shall also furnish any additional information relative to such mine that the State Mineralogist may from time to time require for the proper discharge of his official duties. Any such person who fails to comply with the provisions of this section is guilty of a misdemeanor.\*

2208. The State Mineralogist or a qualified assistant may at any time enter or examine any and all mines, quarries, wells, mills, reduction works, refining works, and other mineral properties or working plants in this State in order to gather data to comply with the provisions of this chapter.

2209. The State Mineralogist may fix a price upon and dispose of to the public all publications of the division, including reports, bulletins, maps, registers, or other publications. The price shall approximate the cost of publication and distribution. He may also furnish the publications of the division to public libraries without cost and may exchange publications with geological surveys, scientific societies, and other like bodies.

2210. All money received by the division from sales of publications issued by the division shall be deposited at least once each month in the State treasury to the credit of the Division of Mines revolving printing fund, which fund is continued in existence. This fund is appropriated for the use of the division, in addition to such other funds as may be appropriated for the printing and publishing of reports, bulletins, and maps issued by the division. The State Controller may require financial reports from the division or any officer thereof.

(Added by Stats. 1939, Ch. 96, as part of codification.)

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\* Sec. 19 of the Penal Code of California provides: "Except in cases where a different punishment is prescribed by this code, every offense declared to be a misdemeanor is punishable by imprisonment in a county jail not exceeding six months, or by a fine not exceeding five hundred dollars, or both."

PUBLICATIONS OF THE DIVISION OF MINES

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During the past sixty-four years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the State, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have usually been limited, the reports and bulletins mentioned are printed in limited editions many of which are now entirely exhausted.

Copies of such publications are available for reference, however, in the offices of the Division of Mines, in the Ferry Building, San Francisco; State Building, Los Angeles; State Office Building, Sacramento; Redding; and Division of Oil and Gas at Santa Barbara, Santa Paula, Taft, Bakersfield, Coalinga. They may also be found in many public, private and technical libraries in California and other states and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained postpaid by addressing the San Francisco, Los Angeles or Sacramento offices and enclosing the requisite amount.

Remittances of stamps in an amount not to exceed 26 cents, currency or coin will be accepted at sender's risk. Payment is preferred in the form of money orders.

Money orders should be made payable to the Division of Mines.

Write for latest revised price list.

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NOTE.—The Division of Mines frequently receives requests for some of the early Reports and Bulletins now out of print, and it will be appreciated if parties having such publications and wishing to dispose of them will advise this office.

## REPORTS

	Price (including postage and sales tax)
Asterisks (**) indicate the publication is out of print.	
**Report I of the State Mineralogist, 1880, 43 pp. Henry G. Hanks	-----
**Report II of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks	-----
**Report III of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks	-----
**Report IV of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks	-----
**Report V of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geo- logical map. Henry G. Hanks	-----
Report VI of the State Mineralogist, Part I, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks	Price \$0.75, sales tax \$0.02 \$0.77
Part II, 1887, 222 pp., 36 illustrations. William Ireland, Jr.	Price \$0.75, sales tax \$0.02 .77
**Report VII of the State Mineralogist, 1887, 315 pp. William Ireland, Jr.	-----
**Report VIII of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Ireland, Jr.	-----
**Report IX of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Ireland, Jr.	Price \$1.15, sales tax \$0.03 1.18
**Report X of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Ireland, Jr.	-----
**Report XI (First Biennial) of the State Mineralogist, for the two years end- ing September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Ireland, Jr.	Price \$1.50, sales tax \$0.04 1.54
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<b>Nevada County Map</b> , accompanying report on mines and mineral resources of Nevada County in July, 1941, Chapter of Report XXXVII, sold separately -----	Price \$0.15, sales tax \$0.01 .16
<b>Oil and Gas Fields</b> (showing California geology uncolored), accompanying Bulletin 118, sold separately -----	Price \$1.00, sales tax \$0.03 1.03
<b>Index map of Economic Minerals and Geomorphic Provinces</b> -----	Free
<b>Imperial Co. Map</b> , accompanying report on mines and mineral resources of Imperial County in April, 1942, Chapter of Report XXXVIII, sold separately -----	Price .10
<b>Tungsten Properties in California</b> , accompanying July-October, 1942, Chapter of Report XXXVIII (showing California geology uncolored), sold separately -----	Price \$0.60, sales tax \$0.02 .62
<b>Santa Cruz Co. Map</b> , accompanying report on mines and mineral resources of Santa Cruz County in January, 1943, Chapter of Report XXXIX, sold separately -----	Price \$0.15, sales tax \$0.01 .16
<b>San Benito Quadrangle Geologic Map</b> , accompanying report on geology of area in April, 1943, Chapter of Report XXXIX, sold separately -----	Price \$0.40, sales tax \$0.01 .41
<b>San Bernardino County Map</b> , accompanying report on mines and mineral resources of San Bernardino County in October, 1943, Chapter of Report XXXIX, sold separately -----	Price \$0.15, sales tax \$0.01 .16
<b>Manganese Deposits</b> (showing California geology uncolored), accompanying Bulletin 125, sold separately -----	Price \$0.60, sales tax \$0.02 .62

## DETERMINATION OF MINERAL SAMPLES

Samples (limited to two at one time) of any mineral found in the State may be sent to the Division of Mines for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the State. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

## OIL AND GAS FIELD MAPS

The following maps are on sale at the State Division of Oil and Gas, Ferry Building, San Francisco, and the various branch offices. The maps are revised as development work advances and ownerships change. Price includes postage and sales tax.

No.	Price
1—Sargent, Santa Clara County-----	\$0.75
2—Santa Maria, including Cat Canyon — Los Alamos, Santa Barbara County-----	1.25
3—Santa Maria, including Casmalia and Lompoc, Santa Barbara County--	1.25
4—Brea Olinda and East Coyote, Los Angeles, Orange Counties-----	1.25
6—Salt Lake—Beverly Hills, Los Angeles County-----	1.25
7—Sunset, including San Emidio, Kern County-----	1.25
8—South Midway, including Buena Vista Hills, Kern County-----	1.25
9—North Midway and McKittrick, Kern and San Luis Obispo Counties-----	1.25
10—South Belridge and McKittrick-Temblor oil fields, Kern County-----	1.25
11—Lost Hills and North Belridge, including Antelope Hills, Kern County---	1.25
12—Devils Den, Kern County-----	1.00
13—Kern River and Kern Front fields, including portion of Poso Creek field, Kern County-----	1.00
14—Coalinga and East Coalinga Extension, Fresno County-----	1.50
15—Elk Hills, Kern County-----	1.25
16—Ventura-Ojai, Ventura County-----	1.25
17—Santa Paula-Ojai, including South Mountain, Ventura County-----	1.25
18—Sespe-Piru-Simi, including Bardsdale, Ventura County-----	1.50
18a—Newhall, Aliso Canyon, Newhall-Potrero, Del Valle and Oak Canyon, Los Angeles County-----	1.25
19—Arroyo Grande, San Luis Obispo County-----	1.00
20—Long Beach, Los Angeles County-----	1.75
21B—District 5, boundaries of areas including oil fields, Fresno, Kings and Kern Counties-----	1.00
21C—District 4, boundaries of areas including oil fields, Kern, Kings and Tulare Counties-----	1.25
22—District 3, boundaries of areas including oil fields, Santa Barbara County	.75
23—District 2, boundaries of areas including oil fields, Ventura County-----	1.00
24—District 1, boundaries of areas including oil fields, Los Angeles and Orange Counties-----	1.00
26—Huntington Beach, Orange County-----	1.50
27—Santa Fe Springs, Los Angeles County-----	1.25
28—Torrance, Los Angeles County-----	1.25
28a—Townlot area, Torrance field, Los Angeles County-----	.75
29—Dominguez, Los Angeles County-----	1.00
30—Rosecrans, Los Angeles County-----	1.25
31—Inglewood, Los Angeles County-----	1.25
32—Seal Beach, Los Angeles and Orange Counties-----	1.25
33—Rincon, Ventura County-----	1.50
34—Mt. Poso and Poso Creek, Kern County-----	1.00

## OIL AND GAS FIELD MAPS—Continued

<i>No.</i>	<i>Price</i>
35—Round Mountain, Kern County-----	\$1.00
36—Kettleman North Dome and Middle Dome, Fresno and Kings Counties--	1.50
37—Montebello, Los Angeles County-----	1.00
38—Whittier, Los Angeles County-----	1.25
39—West Coyote Oil Field, Los Angeles and Orange Counties-----	1.25
40—Elwood, Goleta (abandoned), La Goleta (gas), Santa Barbara County--	1.25
41—Potrero, Los Angeles County-----	1.00
42—Playa del Rey, Los Angeles County-----	1.50
43—Capitan, Santa Barbara County-----	1.00
44—Mesa, Santa Barbara County-----	1.50
46—Richfield, Orange County-----	1.25
48—Mountain View and Edison, Kern County-----	1.25
49—Fruitvale, Kern County-----	1.00
50—Wilmington, Los Angeles County-----	1.25
51—Santa Maria Valley, Santa Barbara County-----	1.00
52—El Segundo and Lawndale, Los Angeles County-----	1.50
53—Rio Bravo and Greeley, Kern County-----	1.00
54—Wasco oil field, Buttonwillow and Semitropic (gas), Kern County-----	1.25
55—Canal, Canfield Ranch, Coles Levee, Strand, Ten Section, Kern County--	1.25
56—Paloma, Kern County-----	1.25
57—Rio Vista (gas), Sacramento, Solano, and Contra Costa Counties-----	1.00
58—Trico Gas, Kern, Kings and Tulare Counties-----	1.00
59—Raisin City, Helm and Riverdale, including Wheatville area, Fresno County -----	1.25

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DEPARTMENT OF NATURAL RESOURCES

GEOLOGY OF THE SAN JUAN  
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